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SCIENTIFIC REPORT

ABSORPTION BY CO_2 BETWEEN 4500 AND 5400 cm^{-1}

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ABSTRACT

The absorption by 38 different samples of CO_2 in the 4500 - 5400 cm^{-1} (near 2 microns) region has been studied with the use of a spectrometer having a spectral resolution between approximately 0.3 and 1 cm^{-1}. Samples of CO_2 and $CO_2 + N_2$ were contained in two different absorption cells; one having a maximum path of 933 meters and used at a maximum pressure of 2.5 atm. The other was used at paths as long as 32.9 meters and at pressures as high as 15 atm. Photographs of the spectra of every sample as well as a table of transmittance versus wavenumber are included. Also presented is a table of the integrated absorptance

$$\int_{\nu 1}^{\nu} \left[1 - T(\nu)\right] d\nu$$

versus ν, where approximately 600 values are tabulated for the largest samples.

ACKNOWLEDGMENT

The authors would like to acknowledge the assistance of several people during the course of this investigation. Mr. Francis Gates performed much of the work in getting the instruments assembled and in reducing the data. Mr. Ronald Steen also helped considerably in digitizing the data. Dr. Byron Edwards provided much assistance in developing the method and the instruments used in digitizing the spectral records. Mr. Ricardo DeCasas wrote the computer program and assisted in all the work connected with the computer.

Dr. William S. Benedict of Johns Hopkins University made many worthwhile suggestions and is responsible for the identification of several new absorption bands. Several helpful discussions with Drs. Louise Gray and Lewis Kaplan of the Jet Propulsion Laboratory are also greatly appreciated.

FOREWORD

The work reported here is a portion of an extensive investigation of the absorption of infrared radiation by atmospheric gases. Reports similar to this one but dealing with other spectral regions will be published within the next few months. This report does not contain much in the way of analysis of the data, but very detailed results are included in a manner which should be convenient for other workers. We expect to use the data presented here for at least one more report which will deal with the shapes and strengths of many of the weaker bands and with the application of the results to problems dealing with paths through the atmospheres of the earth and other planets.

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SECTION 1

INTRODUCTION AND SUMMARY

The major portion of the absorption by CO_2 in the 4500-5400 cm^{-1} region (near 2 microns) is due to three combination bands: $2\nu_1 + \nu_3$ whose center is at 5099.62 cm^{-1}, $\nu_1 + 2\nu_2 + \nu_3$ at 4977.79 cm^{-1} and $4\nu_2 + \nu_3$ at 4853.58 cm^{-1}. Besides these three bands of medium strength, there are approximately 40 weaker bands which have been observed in this region, and at certain wavenumbers one or more of them may produce most of the absorption.

Howard, Burch and Williams[1] have made some quantitative measurements on the absorption in this region, but the spectral resolution of their instrument was low. Courtoy[2] has measured the positions of several hundred absorption lines with very good accuracy and has identified many bands which had not been observed previously; but only limited information about the amount of absorption one might expect from a given sample can be obtained from his results. Weber, Holm and Penner[3] have measured the strengths of the three main bands, but with an accuracy of only ± 20 percent. Breeze and Ferriso[4] have also investigated the effect of changing the temperature on the band strengths. Kuiper[5] has investigated the absorption by large samples; but his measurements were made with only moderate resolution and at pressures of several atmospheres.

Because of the limitations of the previous work, there was still need for data on samples covering wide ranges of pressure and absorber thickness and with resolution sufficiently good that at least some lines from most of the bands could be resolved. The present investigation was undertaken for the purpose of obtaining these data. The long absorption cell with possible paths as great as 933 meters has enabled us to study

samples having very large absorber thickness at pressures which are not so great as to smooth out the structure in the band. The short absorption cell has also made it possible to investigate samples at higher pressures in order that band strengths can be measured easily.

From the results presented in this report one should be able to determine the strengths of nearly every band of any significance in this region. The widths of most of the lines can also be determined from "curves of growth" of the average absorptance over relatively narrow intervals. Once the strengths and widths of the lines have been found, the absorptance at any wavenumber can be calculated for a great variety of samples, even though they are quite different from any of the samples studied. This is true, even for samples having non-uniform temperature and pressure.

Because of the long paths which are possible with the long absorption cell, we have been able to observe and identify five new CO_2 bands in this region which have not been reported previously. Approximate strengths of these as well as the three major bands have been determined and are tabulated in Section 3.

Spectra of 38 samples covering a wide range of pressures and path lengths have been reproduced and digitized. The reproduced spectra are shown in Section 5 and a table of transmittance $T(\nu)$ versus wavenumber ν is presented in Section 6. Section 7 contains a table of

$$\int_{\nu^1}^{\nu} [1 - T(\nu)]\, d\nu,$$

the integrated absorptance versus wavenumber; ν^1 is on the low wavenumber side of the region considered for a given sample, and tabulations are made for nearly 600 different values of ν for the largest samples.

Detailed descritpions of the two absorption cells used and of the digitizing apparatus are given in Appendices A, B, and C.

SECTION 2

EXPERIMENTAL METHODS

2.1 GAS SAMPLING

Samples of CO_2 and $CO_2 + N_2$ were contained in two different absorption cells which are described in detail in Appendices A and B. The longer cell has a base length of approximately 30 meters and was used at as many as 32 passes, giving a total path length of 933 meters. This cell is approximately 0.9 meters in diameter and can be evacuated to less than 1 micron of Hg or pressurized to as much as 2.5 atmospheres. The shorter cell has a base length of approximately 1 meter and was used at as many as 32 passes. It also can be evacuated and pressurized to as much as 15 atmospheres.

The CO_2 was taken from the vapor in a dewar which contained both liquid and vapor. It was maintained at a temperature less than about $-20^{o}C$, so that the pressure never exceeded approximately 300 psig. There was found to be considerably less water in the sample if it were drawn from the vapor over the liquid rather than allowing the liquid to be drawn off and to evaporate into the cell. It appeared as though most of the water in the CO_2 container was trapped in the liquid CO_2; and if the liquid was drawn off the H_2O was allowed to enter the absorption cell. Of course, as the vapor was drawn off the pressure, and thus the temperature, in the dewar dropped considerably and the filling rate decreased. When the pressure dropped below about 50 psig, the valves were closed and the dewar was allowed to warm up. Approximately two days were required to fill the large absorption cell to 2.5 atmospheres from two dewars of CO_2.

The cell could have been filled in much less time by drawing off the liquid CO_2 rather than the vapor, but the slower technique was chosen because of the drier samples which could be obtained. The amount of H_2O in the N_2 was much less than that in the CO_2; therefore, it was not necessary to take extreme care to reduce the amount of H_2O put into the sample with the N_2 which was drawn off as a liquid into a heat exchanger where it evaporated and entered the cell.

Before introducing a sample into the cell, the cell was pumped for several hours in order to get rid of most of the H_2O which was adsorbed on the walls. This can be very important, depending on the previous sample in the cell. Even after using this much care, the absorption by traces of H_2O in the sample was bothersome at some wavenumbers.

CO_2 + N_2 mixtures were mixed in the cell; CO_2 was added to the desired pressure, N_2 was then added and the mixing was accomplished by fans inside the absorption cells. No attempt was made to change the relative abundances of the different isotopes of C or O in the samples studied.

Sample pressures less than approximately 0.06 atm were measured with a U-tube oil manometer, and a U-tube H_g manometer was used for pressures in the range $0.06 < P < 2$ atm. All pressures > 2 atm were measured with a bourdon-type gauge.

Since CO_2 varies significantly from a perfect gas at some of the higher pressures used in this investigation, it was necessary to account for the Van der Waals' forces giving rise to the deviation from the perfect gas. In calculating the absorber thickness u, the following equation was used:

$$u = W\, p\, L \frac{273}{296} \quad \text{(atm cm) STP.} \tag{1}$$

L is the path length in centimeters,

p is the partial pressure of CO_2 in atmospheres,

273/296 accounts for the difference in density between room temperature and standard temperature,

W is a correction term which accounts for the Van der Waals' forces and is given adequately for the pressures used in this investigation by

$$W = 1.00 + 0.0047\, p. \tag{2}$$

All measurements were made with the samples at room temperature, approximately 296°K.

In order to relate the pressure of a sample to the half-width of the absorption lines, it is necessary to account for the different broadening abilities of CO_2 and N_2 when dealing with mixtures of these two gases. Burch, Gryvnak and Williams[6] have used an equivalent pressure P_e given by

$$P_e = 1.3\ p + (P - p) \tag{3}$$

where P is the total pressure. It is noted that the equivalent pressure approaches the total pressure for a very dilute mixture of CO_2 in N_2.

Since the simple classical theory predicts that the half-width of a line is proportional to the density of molecules, equation (3) should probably be modified to account for Van der Waals' forces which cause the density to increase faster than the pressure. The adjustment can be made by modifying (3) in the following way:

$$P_e = 1.3\ W\ p + (P - p). \tag{3'}$$

The factor 1.3 is not valid in all portions of the spectrum, but it has been found to represent satisfactorily the different broadening abilities throughout most portions of the band not too distant from the absorption lines producing the absorption. Winters, Silverman and Benedict[7] have found, for example, that the self-broadening factor should be considerably greater than 1.3 when dealing with regions such as that on the high wavenumber side of the 2350 cm^{-1} CO_2 band, where all of the absorption is due to the wings of very strong lines whose centers are several cm^{-1} away. This results from the fact that the shape of a self-broadened line several cm^{-1} from the line center is quite different from that of a nitrogen-broadened line. Although (3') does not give an accurate representation of an equivalent pressure which is proportional to the line half-width for all regions in the spectrum, it is adequate in most cases and serves to simplify the analysis of the data. As more accurate methods of accounting for the self-broadening are found a better value for equivalent pressure for the samples in any spectral region can be obtained.

2.2 RECORDING AND CALIBRATION OF SPECTRA

The spectrometer is "home made" and was contained in a tank which could be evacuated to essentially eliminate absorption due to atmospheric gases outside of the absorption cell. The spectrometer tank, as well as another tank containing the radiation source and chopper, were connected to the absorption cell by means of flexible bellows so that all of the optical path external to the absorption cell could be evacuated.

The spectrometer is of the Ebert type with the main mirror having a 75 cm focal length. It utilized a small grating having a ruled area 64 x 64 mm with 600 lines/mm and blazed at 1.6 microns. The grating was used in the first order and a Ge filter eliminated overlapping orders of shorter wavelength. A PbS cell cooled with liquid nitrogen was used as the detector. It was not necessary to cool the detector below dry ice temperature for operation in this wavelength region, but the dewar was designed to hold the liquid nitrogen for use at longer wavelengths. Cooling by liquid nitrogen was, therefore, more convenient and was used since the signal-to-noise ratio was approximately the same at both temperatures. Three different resolution schedules were used in recording the spectra; the approximate spectral slitwidths for each schedule at three different wavenumbers are given in Table 2-1.

TABLE 2-1

RESOLUTION SCHEDULES

ν (cm^{-1})	Spectral Slitwidth (cm^{-1})		
	Schedule A	Schedule B	Schedule C
4600	0.30	0.39	0.54
5000	0.35	0.50	0.70
5400	0.41	0.62	0.86

Resolution Schedule A was used in several regions of the spectrum to resolve closely spaced lines; but because of the small signal available while using this schedule, considerable time was required to scan a portion of the spectrum. Therefore, Schedule B

which represents a compromise between resolution and scanning time was used for the majority of the data. Schedule C was used for some spectra of samples at several passes of the absorption cell for which the signal was low.

Background curves were obtained with the sample cell evacuated for each number of passes for which measurements were obtained. The background curve was different for different numbers of passes since the reflectivity of the mirrors in the multiple-pass optics varies with wavenumber. The appropriate background curve which represents 100 percent transmittance was then fitted to each spectrum and traced on it. All the sample spectra extended beyond the region of absorption on both ends of the band so that dependable "tie-points" between a spectrum and its background could be established. The transmittance was determined from the ratio of the deflection of the sample spectrum to that of the background curve at the same wavenumber. Each spectrum was digitized, with the information put on IBM cards by the technique which is described in considerable detail in Appendix C.

Most of the points used in the wavenumber calibration were obtained from the CO_2 lines of the bands being studied since the positions of many of them have been determined with very good accuracy by Courtoy[2]. The lines of a few other bands which have not been measured or calculated by Courtoy can be determined from the values of the molecular constants provided by him. The wavenumbers of several lines in the 002 band of $CO^{16}O^{18}$ which was omitted by Courtoy have been measured by Díaz[8]; his values were used for calibration in the region of this band. H_2O lines whose positions are well known were also used as standards in certain parts of the spectrum.

Lines separated by an average of about 10 cm^{-1} were used in calibrating each spectrum; it was assumed that each spectrum was linear between the calibration points. The absorption lines used as standards are summarized in Table 5-1, and each of the lines is indicated in the spectra shown in Section 5.

SECTION 3

DISCUSSION OF ABSORPTION BANDS

3.1 IDENTIFICATION OF ABSORPTION BANDS

All of the absorption bands of the various isotopes of CO_2 which absorb appreciably in this region are listed in Table 3-1. ν_o is the wavenumber of the center of the band for the species and the transition indicated. Portions of all but five or six of these absorption bands have been observed with good resolution in the very extensive work of Courtoy[2]. By using samples in which the abundances of some of the less common isotopes were enhanced, Courtoy was able to observe absorption lines which would otherwise be hidden by the lines of the more common isotopes. Several of the absorption bands of these rarer isotopes do not contribute significantly to the absorption by samples having the natural abundance of each isotope.

Most of Courtoy's measurements dealt with the determination of the positions of the absorption lines with very good accuracy, but only limited information about the strengths of the lines can be obtained from his results. Kuiper[5] has measured the absorption by large samples for about 20 absorption bands in this region and correlated some of them with bands observed in the spectrum of Venus. Kuiper also observed some absorption at about 4505 cm^{-1} which he attributed to the 002←000 transition of $C^{13}O^{16}O^{18}$. We were not able to observe this band for the largest sample used, which was at a pressure of 2.5 atm and a path length of 933 meters. In our experiment the noise is approximately three or four percent of the signal in this portion of the spectrum when operating at the maximum path length; therefore, it is possible that the absorptance near the middle of a band in this region could be as much as 0.02 or 0.03 without being detected by us. Unfortunately, only two or three spectra of very large samples were obtained by us in this region

TABLE 3-1

CO_2 BANDS BETWEEN 4500 and 5400 cm^{-1}

ν_o cm^{-1}	Transition	Species	ν_o cm^{-1}	Transition	Species
4591.0[a]	15^10[b]	$C^{12}O_2^{16}$	4942.484	$14^01 \leftarrow 02^00$	$C^{12}O_2^{16}$
4639.53[c]	00^02	$C^{12}O^{16}O^{18}$	4953.327	$14^21 \leftarrow 02^20$	$C^{12}O_2^{16}$
4673.635	$06^21 \leftarrow 02^20$	$C^{13}O_2^{16}$	4959.635	$22^01 \leftarrow 10^00$	$C^{12}O_2^{16}$
4685.715	$06^01 \leftarrow 02^00$	$C^{13}O_2^{16}$	4965.337	$13^11 \leftarrow 01^10$	$C^{12}O_2^{16}$
4687.75[a]	$06^01 \leftarrow 10^00$	$C^{12}O_2^{16}$	4976.095	$22^01 \leftarrow 02^00$	$C^{13}O_2^{16}$
4692.120	04^01	$C^{13}O^{16}O^{18}$	4977.793	12^01	$C^{12}O_2^{16}$
4708.477	$05^11 \leftarrow 01^10$	$C^{13}O_2^{16}$	4991.309	20^01	$C^{13}O_2^{16}$
4748.012	04^01	$C^{13}O_2^{16}$	4993.520	$30^01 \leftarrow 10^00$	$C^{13}O_2^{16}$
4768.49	$06^21 \leftarrow 02^20$	$C^{12}O_2^{16}$	5013.730	$21^11 \leftarrow 01^10$	$C^{13}O_2^{16}$
4790.520	$06^01 \leftarrow 02^00$	$C^{12}O_2^{16}$	5028.730	$22^21 \leftarrow 02^20$	$C^{13}O_2^{16}$
4791.208	20^01	$C^{12}O^{16}O^{18}$	5042.538	04^01	$C^{12}O^{16}O^{18}$
4807.652	$05^11 \leftarrow 01^10$	$C^{12}O_2^{16}$	5062.394	$22^01 \leftarrow 02^00$	$C^{12}O_2^{16}$
4814.530	12^01	$C^{13}O^{16}O^{18}$	5099.619	20^01	$C^{12}O_2^{16}$
4839.704	$14^01 \leftarrow 10^00$	$C^{12}O_2^{16}$	5123.170	$21^11 \leftarrow 01^10$	$C^{12}O_2^{16}$
4853.578	04^01	$C^{12}O_2^{16}$	5139.400	$22^21 \leftarrow 02^20$	$C^{12}O_2^{16}$
4853.745	$14^01 \leftarrow 02^00$	$C^{13}O_2^{16}$	5168.60	01^12	$C^{13}O_2^{16}$
4858.100	$14^21 \leftarrow 02^20$	$C^{13}O_2^{16}$	5217.63[a]	$30^01 \leftarrow 02^00$	$C^{12}O_2^{16}$
4871.408	$13^11 \leftarrow 01^10$	$C^{13}O_2^{16}$	5248[a]	$02^02 \leftarrow 01^10$	$C^{12}O_2^{16}$
4871.860	$22^01 \leftarrow 10^00$	$C^{13}O_2^{16}$	5291.12	$02^22 \leftarrow 01^10$	$C^{12}O_2^{16}$
4887.348	12^01	$C^{13}O_2^{16}$	5315.696	01^12	$C^{12}O_2^{16}$
4904.820	12^01	$C^{12}O^{16}O^{18}$	5349[a]	$10^02 \leftarrow 01^10$	$C^{12}O_2^{16}$
4924.990	20^01	$C^{13}O^{16}O^{18}$			

[a]Observed in present study only; not reported previously.

[b]Absence of quantum numbers for lower state indicates they are all zero.

[c]Observed by Kuiper, positions of lines measured later by Diaz. Not observed by Courtoy.

of the spectrum, so that it is not possible to be sure that there is no absorption present. But in view of the fact that our largest sample was considerably bigger than the largest used by Kuiper, and since our spectral resolution is greater than his, it seems likely that the absorption observed by him in this region is due to some gas other than CO_2 which was present in his sample. Of course, it is conceivable that the abundance of O^{18} was greater in his sample than in ours; in which case he would be able to observe the band when we would not.

Other than for this apparent disagreement near 4505 cm^{-1}, there is good qualitative agreement among the results of the present study and those of Kuiper and Courtoy.

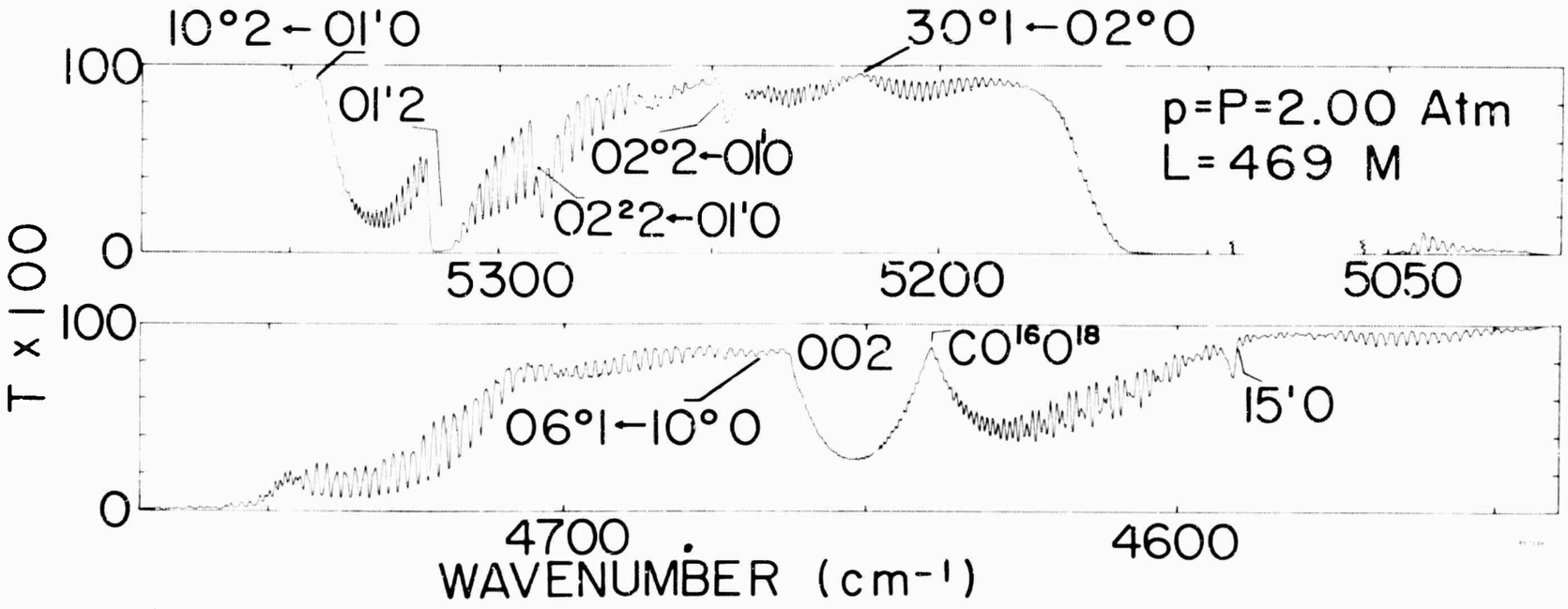
Because of the extremely large samples which were used in the present investigation, five new absorption bands which have not been reported previously were observed. These new bands are included in Table 3-1 and the identifications have been made from our spectra by Dr. William Benedict[9]. A spectrum of a very large sample which shows these new bands is given in Figure 3-1. The two panels of the figure represent the ends of the spectral region considered in this report; the sample is opaque in the regions not shown. The 002 band of $CO^{16}O^{18}$ has been observed by Kuiper[5] and Diaz[8], who have measured the positions of several of the lines in this band with very good accuracy. Courtoy has observed the 01^12 and 02^22–01^10 bands, but the other bands which are identified in the figure have not been reported previously.

3.2 BAND STRENGTHS

The strength, or intensity of an absorption band is given by $\int K(\nu)d\nu$, where $K(\nu)$ is the absorption coefficient defined by

$$T'(\nu) = \exp(-K(\nu)u).$$

$T'(\nu)$ is the true transmittance at ν which would be observed by a spectrometer with infinite resolution. The strength of a band is proportional to the transition probability and, by the use of theoretical considerations, one can calculate from it the strengths of individual lines within the band. The reverse is, of course, also true; the strength of a band, or at least the strength of one branch, can usually be calculated from the strength of one line.



RO7104 FIGURE 3-1. SPECTRUM OF A VERY LARGE SAMPLE OF CO_2 BETWEEN 4540 AND 5380 cm^{-1}

The sample is opague in the spectral regions from approximately 4775 to 5020 cm^{-1} and fror 5050 to 5160 cm^{-1}. The broken portions of the curve represent regions where attempts have been made to correct for considerable absorption by H_2O. The 002 band of $CO^{16}O^{18}$ has been observed by Kuiper and by Diaz; and Courtoy has observed the $01^{1}2$ and $02^{2}_{4}01^{1}0$ bands. The other bands which are identified have not been reported previously. Only a few of the lines near P20 of the $06^{0}_{4}10^{0}0$ band can be observed in the region indicated; the other lines of this band are overlapped by stronger lines.

The strengths of many of the bands in this spectral region could be determined from the data presented in this report. However, at the present time, the only bands whose strengths have been considered are the three major ones, $2\nu_1 + \nu_3$, $\nu_1 + 2\nu_2 + \nu_3$ and $4\nu_2 + \nu_3$ and the five new bands which have not been reported previously. The strengths of as many of the branches of these bands as it has been possible to determine are given in Table 3-2.

TABLE 3-2

BAND STRENGTHS

Transition[a]	ν_o cm^{-1}	$\int K(\nu)d\nu$ (atm^{-1} cm^{-1} cm^{-1})STP				
		P	Q	R	Total Band[b]	Total Band Weber et al[c]
		Major Bands				
04^01	4853.578	0.11	0.00	0.12	0.23	0.30
12^01	4977.793	0.52	0.00	0.53	1.05	1.11
20^01	5099.619	0.15	0.00	0.18	0.33	0.47
		New Bands[d]				
15^10	4591.0	0.16	0.04	0.22	0.42	
$06^01 \leftarrow 10^00$	4687.75	0.06				
$30^01 \leftarrow 02^20$	5217.63		0.00	0.27		
$02^02 \leftarrow 01^10$	5248	0.09	0.17	0.07	0.33	
$10^02 \leftarrow 01^10$	5349	0.03	0.08	0.03	0.14	

[a] All bands listed in this Table pertain to the $C^{12}O_2^{16}$ molecule.

[b] The uncertainty in the values for the major bands is about six or eight percent, but it is considerably higher for the new bands.

[c] Values are taken from Weber, Holm and Penner[3] and multiplied by 300/273 to adjust to density at STP. The authors given an uncertainty of $\pm$ 20%.

[d] The strengths of the new bands were determined from our raw spectra by Benedict[9].

The values given for the new bands should be considered tentative since they were obtained from the "raw" spectra. With some effort it is possible that more accurate values could be determined from the digitized output based on these spectra. Considerably better values could probably be obtained for the new bands from spectra with better resolution for samples containing less H_2O as an impurity.

The strengths of the major bands were determined from spectra of samples at a total pressure of approximately 10 atm. At pressures this high, the lines are wider than the spectral slit width so that the observed spectrum is not greatly different from what would be observed with infinite resolution; i.e., the observed transmittance $T(\nu)$ would be approximately the same as $T'(\nu) = \exp(-K(\nu)u)$. The band strengths were then determined from

$$\int K(\nu)d\nu = \frac{1}{u} \int -\ln T(\nu)d\nu \qquad (4)$$

Strengths of other bands in this region, and possibly some revised values for those listed in Table 3-2, will appear in subsequent reports.

SECTION 4

SAMPLE PARAMETERS

The parameters for the 38 samples used in this investigation are summarized in Table 4-1. The path length L and the following pressures are expressed in both atmospheres and torr (mm Hg):

- p — partial pressure of CO_2.
- P — total pressure due to CO_2 and N_2.
- P_e — the equivalent pressure which accounts for the difference between self-broadening and foreign broadening by nitrogen. It is given by $P_e = 1.3\ W\ p + (P - p)$ where W is a Van der Waals correction given by equation (2).

Reproductions of the spectra of all the samples are shown in Section 5; the page numbers in which the different portions of each spectrum appear are listed in the last six columns of Table 4-1.

The resolution schedule corresponds to the spectral slitwidth of the spectrometer used to record the spectrum. Each schedule is related to slitwidth according to Table 2-1. Spectra of a few samples were obtained with two different resolution schedules; in these cases the same letter was used to identify the sample, but a star was used to denote the different resolution.

The maximum pressure used in the long absorption cell was 2.5 atm; spectra were obtained for the maximum pressure of pure CO_2 at 4, 8, 16 and 32 passes of the cell. The other samples were chosen so as to provide groups having approximately the same value of absorber thickness, which is given by

$$u = W\ p\ L\ \frac{273}{296} \qquad (1)$$

TABLE 4-1

SAMPLE PARAMETERS

Sam. No.	p	P	P_e	p	P	P_e
	torr	torr	torr	atm	atm	atm
a	1900	1900	2500	2.50	2.50	3.29
b	1920	1920	2520	2.53	2.53	3.32
c	1920	1920	2520	2.53	2.53	3.32
d	1900	1900	2500	2.50	2.50	3.29
e	1522	1522	1995	2.00	2.00	2.62
f	760	760	992	1.000	1.000	1.31
g	760	760	992	1.000	1.000	1.31
g*	760	760	992	1.000	1.000	1.31
h	88	88	114	0.116	0.116	0.150
i	175	175	228	0.230	0.230	0.300
i*	175	175	228	0.230	0.230	0.300
j	175	707	759	0.230	0.930	0.999
k	29.4	29.4	38.2	0.0387	0.0387	0.0503
l	58.5	58.5	76.1	0.0770	0.0770	0.1001
l*	58.5	58.5	76.1	0.0770	0.0770	0.1001
m	58.5	212	230	0.0770	0.279	0.303
n	58.5	743	761	0.0770	0.978	1.001
o	8.95	8.95	11.8	0.0118	0.0118	0.0155
p	17.8	17.8	23.1	0.0234	0.0234	0.0304
q	17.8	72	77.3	0.0234	0.0948	0.102
r	17.8	223	228	0.0234	0.293	0.300
s	507	507	661	0.667	0.667	0.870
t	5.8	5.8	7.54	0.00763	0.00763	0.00992
u	5.8	21	22.7	0.00763	0.0276	0.0299
v	165	165	214	0.217	0.217	0.282
w	165	710	760	0.217	0.934	1.000
x	165	2280	2330	0.217	3.00	3.07
y	49.8	49.8	64.7	0.0655	0.0655	0.0851
z	49.8	213	228	0.0655	0.280	0.300
aa	49.8	776	791	0.0655	1.02	1.04
ab	49.8	2280	2295	0.0655	3.00	3.02
ac	49.8	7600	7615	0.0655	10.00	10.02
ad	49.8	213	228	0.0655	0.280	0.300
ae	49.8	2280	2295	0.0655	30.0	3.02
af	25	7600	7610	0.0329	10.00	10.01
ag	100	7600	7630	0.132	10.00	10.04
ah	3.13	25	25.9	0.00412	0.0329	0.0341
ai	3.13	225	226	0.00412	0.296	0.297
aj	3.13	760	761	0.00412	1.000	1.001
ak	3.13	2280	2280	0.00412	3.00	3.00
al	3.13	7600	7600	0.00412	10.00	10.00

TABLE 4-1 (cont.)

Sam. No.	L Path m	u atm cm STP	Res. Sch.	Pages on which spectra appear					
				5375-5185 cm^{-1}	5185-5030 cm^{-1}	5030-4905 cm^{-1}	4905-4795 cm^{-1}	4795-4665 cm^{-1}	4665-4535 cm^{-1}
a	933	217,000	B	5-2	5-4			5-16	5-20
b	469	111,000	B	5-2	5-4			5-16	5-20
c	237	55,700	B	5-2	5-4	5-8		5-16	5-20
d	121	28,100	B	5-3	5-5	5-9		5-17	5-21
e	469	87,100	B	5-3	5-5			5-17	5-21
f	933	86,200	B	5-3	5-5	5-9		5-17	5-21
g	237	21,900	B	5-2	5-4	5-8	5-12	5-16	5-20
g*	237	21,900	A	5-3				5-17	5-21
h	933	9,940	C	5-3	5-5	5-9	5-13	5-17	5-21
i	469	9,950	B	5-2	5-4	5-8	5-12	5-16	5-20
i*	469	9,950	A					5-18	
j	469	9,950	B	5-2	5-4	5-8	5-12	5-16	5-20
k	933	3,320	C	5-2	5-4	5-8	5-12	5-16	
l	469	3,320	B	5-2	5-4	5-8	5-12	5-16	5-20
l*	469	3,320	A		5-6	5-10	5-14	5-18	
m	469	3,320	B	5-3	5-5	5-9	5-13	5-17	5-21
n	469	3,320	B	5-3	5-5	5-9	5-13	5-17	5-21
o	933	1,010	C		5-4	5-8	5-12	5-16	
p	469	1,010	B		5-7	5-11	5-15	5-19	
q	469	1,010	B		5-7	5-11	5-15	5-19	
r	469	1,010	B		5-7	5-11	5-15	5-19	
s	16.5	1,010	B		5-6	5-10	5-14	5-18	
t	469	329	B		5-6	5-10	5-14	5-18	
u	469	329	B		5-4	5-8	5-12	5-16	
v	16.5	330	B		5-5	5-9	5-13	5-17	
w	16.5	330	B		5-5	5-9	5-13	5-17	
x	16.5	330	B		5-4	5-8	5-12	5-16	
y	16.5	99.6	B		5-7	5-11	5-15	5-19	
z	16.5	99.6	B		5-6	5-10	5-14	5-18	
aa	16.5	99.6	B		5-4	5-8	5-12	5-16	
ab	16.5	99.6	B		5-6	5-10	5-14	5-18	
ac	16.5	99.6	B		5-5	5-9	5-13		
ad	4.16	25	B		5-6	5-10	5-14		
ae	4.16	25	B		5-5	5-9	5-13		
af	8.26	25	B		5-5	5-9	5-13		
ag	4.16	50.3	B		5-5	5-9	5-13		
ah	16.5	6.26	B			5-11			
ai	16.5	6.26	B			5-9			
aj	16.5	6.26	B			5-9			
ak	16.5	6.26	B			5-9			
al	16.5	6.26	B			5-8			

SECTION 5

TRANSMISSION SPECTRA

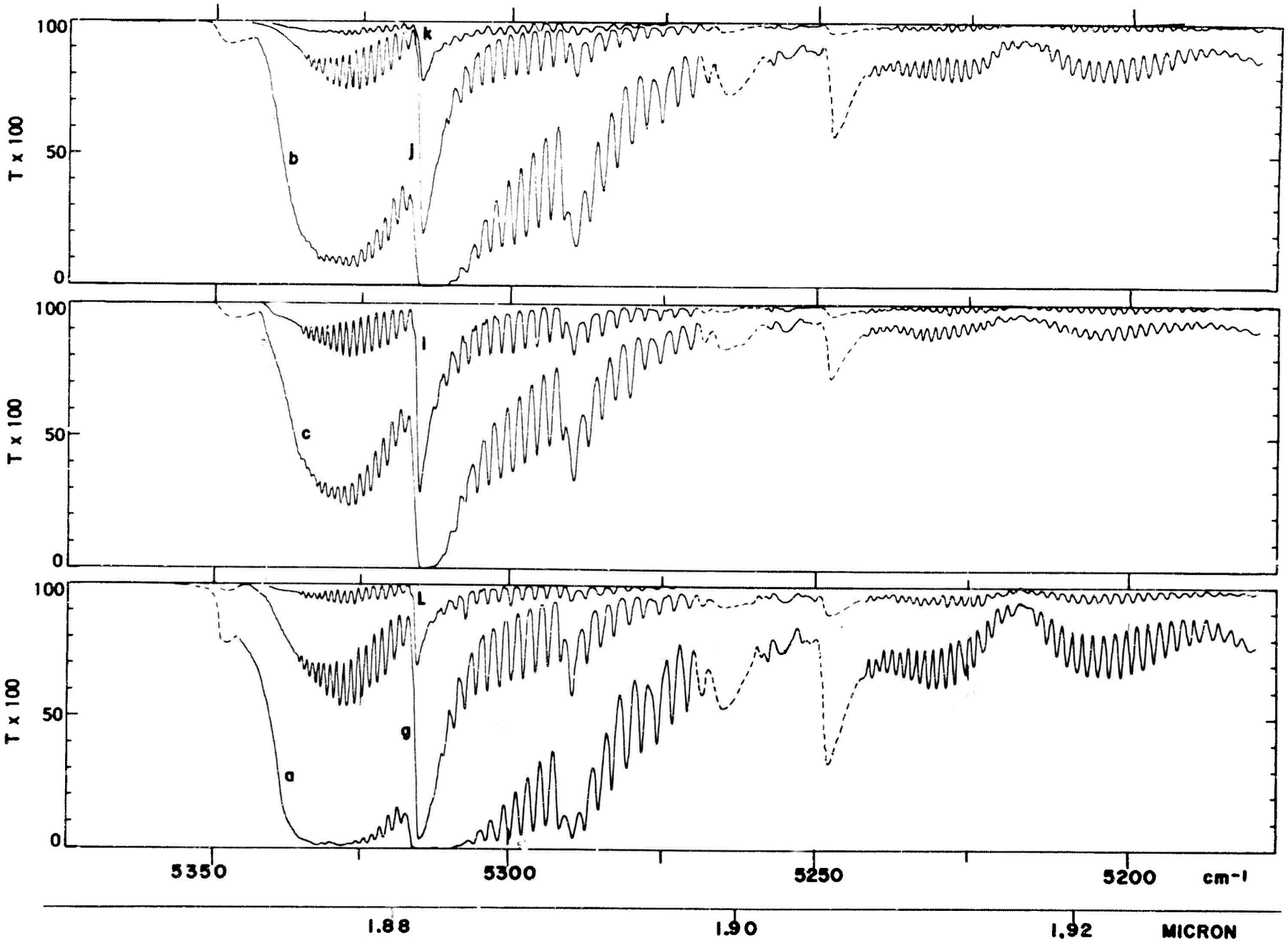
Reproductions of the spectra of 38 samples are shown in this section. The spectra were traced from the originals by use of the equipment described in Appendix C. The spectra are so long that they were divided into the following six regions:

Spectral Region	Pages
5375 - 5185 cm^{-1}	5-2, 5-3
5185 - 5030	5-4 to 5-7
5030 - 4905	5-8 to 5-11
4905 - 4795	5-12 to 5-15
4795 - 4665	5-16 to 5-19
4665 - 4535	5-20, 5-21

The wavenumber scale is accurate to approximately $\pm$ 1 cm^{-1}; more accurate values of line positions can be obtained from Courtoy or by interpolating between the designated calibration points. In some cases the original spectra of samples represented in the same panel in a figure were obtained at quite different times when the wavenumber calibration of the spectrometer was different, and the retraced spectra do not always "nest" properly. There is a slight periodic error in the screw which rotates the grating; therefore, the calibration shift was not linear in wavenumber. Calibration points were taken sufficiently close together that it can be assumed the spectra are linear between them; but the periodic error in the screw would in some cases cause significant error in calibration if one were to assume a spectrum was linear over an interval as wide as 20 or 30 cm^{-1}. The positions of known H_2O and CO_2 lines used for calibration are indicated by numbers in the figures, and the corresponding wavenumbers are listed in Table 5-1.

Each sample is designated by the same letter as that given in Table 4-1. The spectra designated by starred letters correspond to the same sample as the unstarred letter, but the spectrum was obtained with higher resolution in order to resolve more lines and to determine more accurate positions of the line centers. No calculations of transmittance or integrated absorptance were made from the spectra marked with stars.

Regions where the CO_2 absorption was difficult to observe because of overlapping absorption by H_2O are indicated by dotted lines. Portions of some spectra were omitted where the absorption was small, particularly when spectra of larger samples having greater absorption in the same region are included.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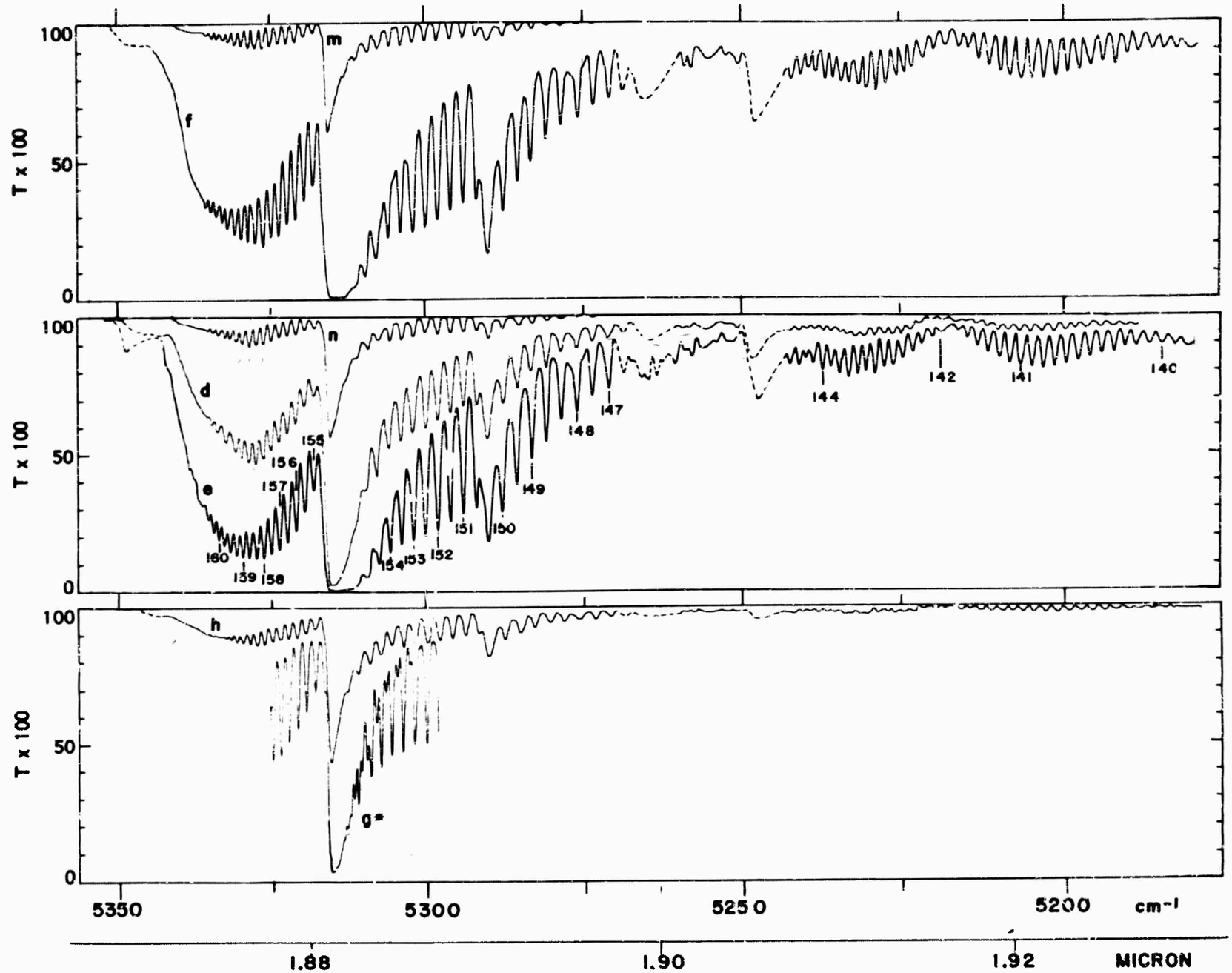
50
0
T x 100
k
b
j
i
c
L
g
a
5350
5300
5250
5200
cm-1
1.88
1.90
1.92
MICRON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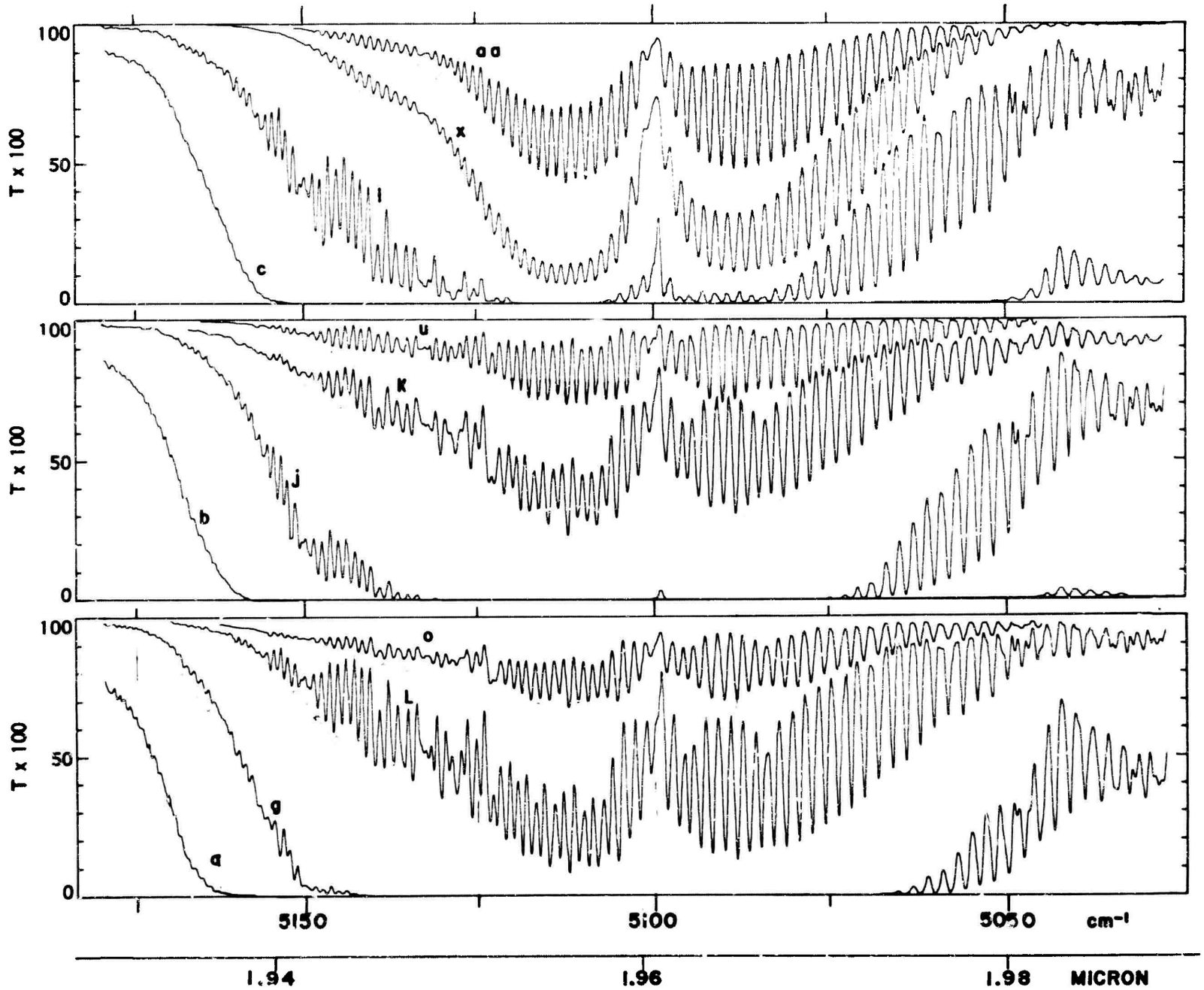
50
0
T x 100
m
f
n
d
e
h
g*
156
155
157
160
139
158
154
153
152
151
150
149
148
147
144
142
141
140
5350
5300
5250
5200
cm-1
1.88
1.90
1.92
MICRON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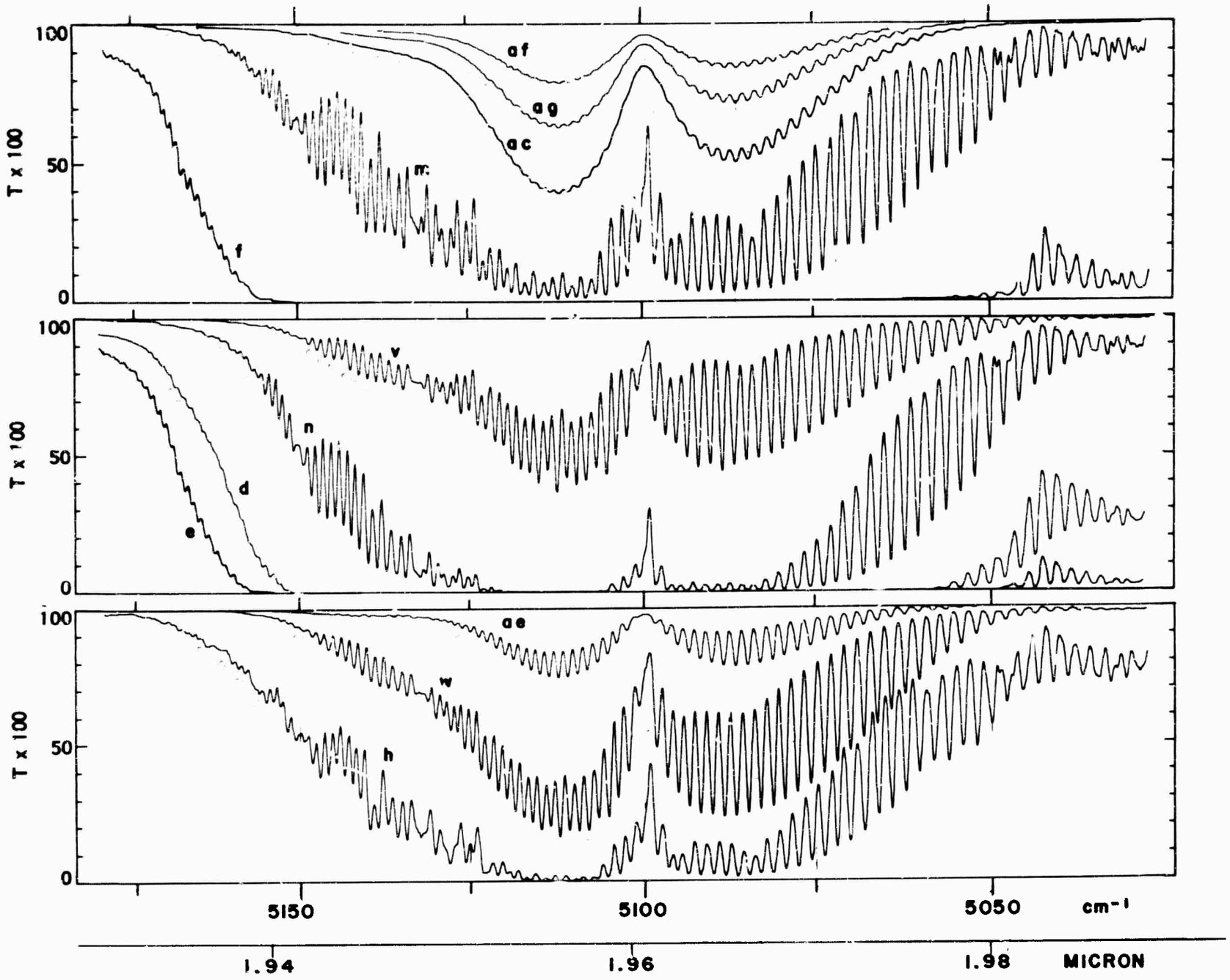
50
0
T x 100
aa
x
i
c
u
K
j
b
o
L
g
a
5150
5100
5050
cm-1
1.94
1.96
1.98
MICRON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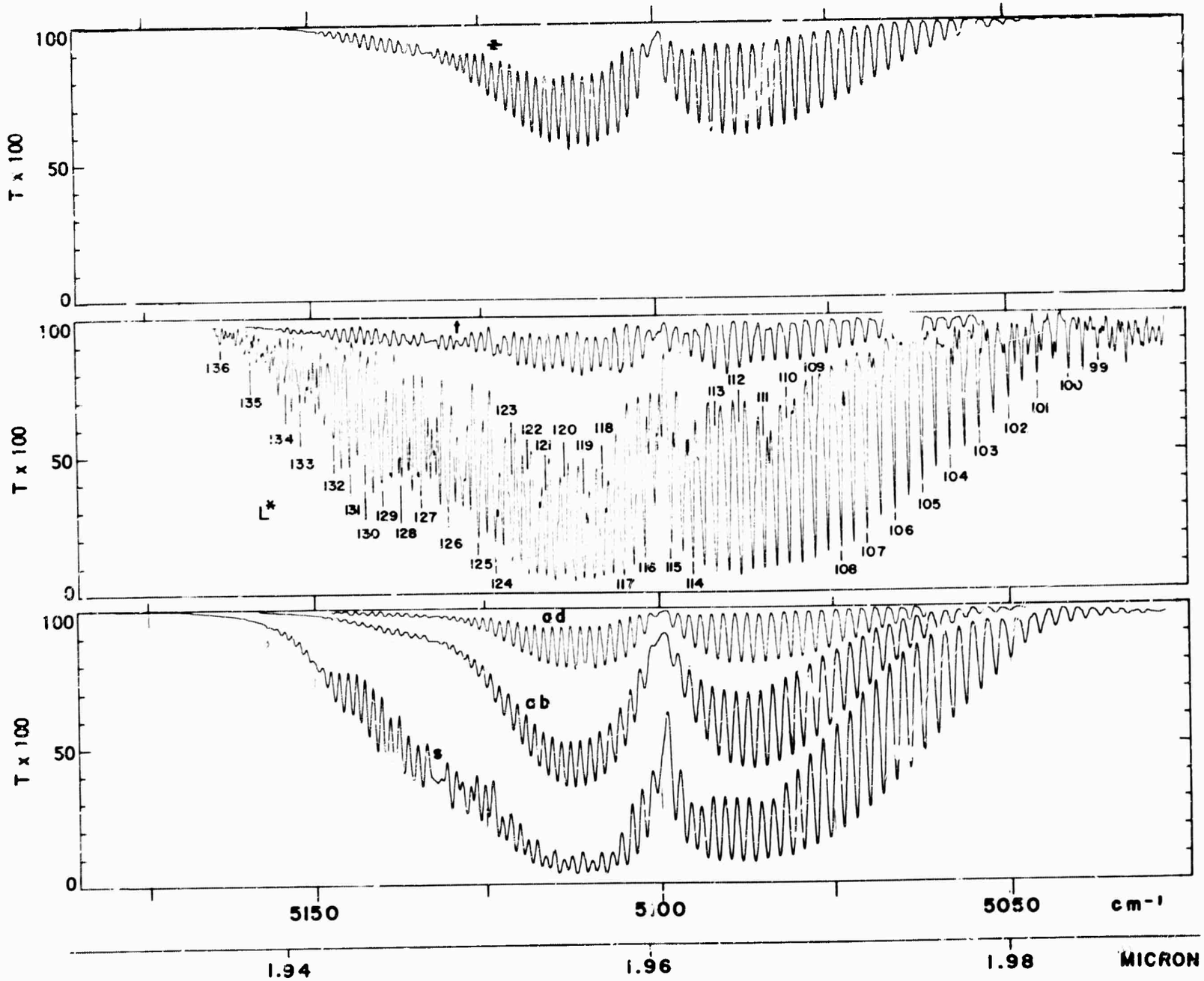
50
0
T x 100
af
ag
ac
m
f
v
n
d
e
ae
w
h
5150
5100
5050
cm-1
1.94
1.96
1.98
MICRON


T x 100
100
50
0
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135
134
133
132
131
130
129
128
127
126
125
124
123
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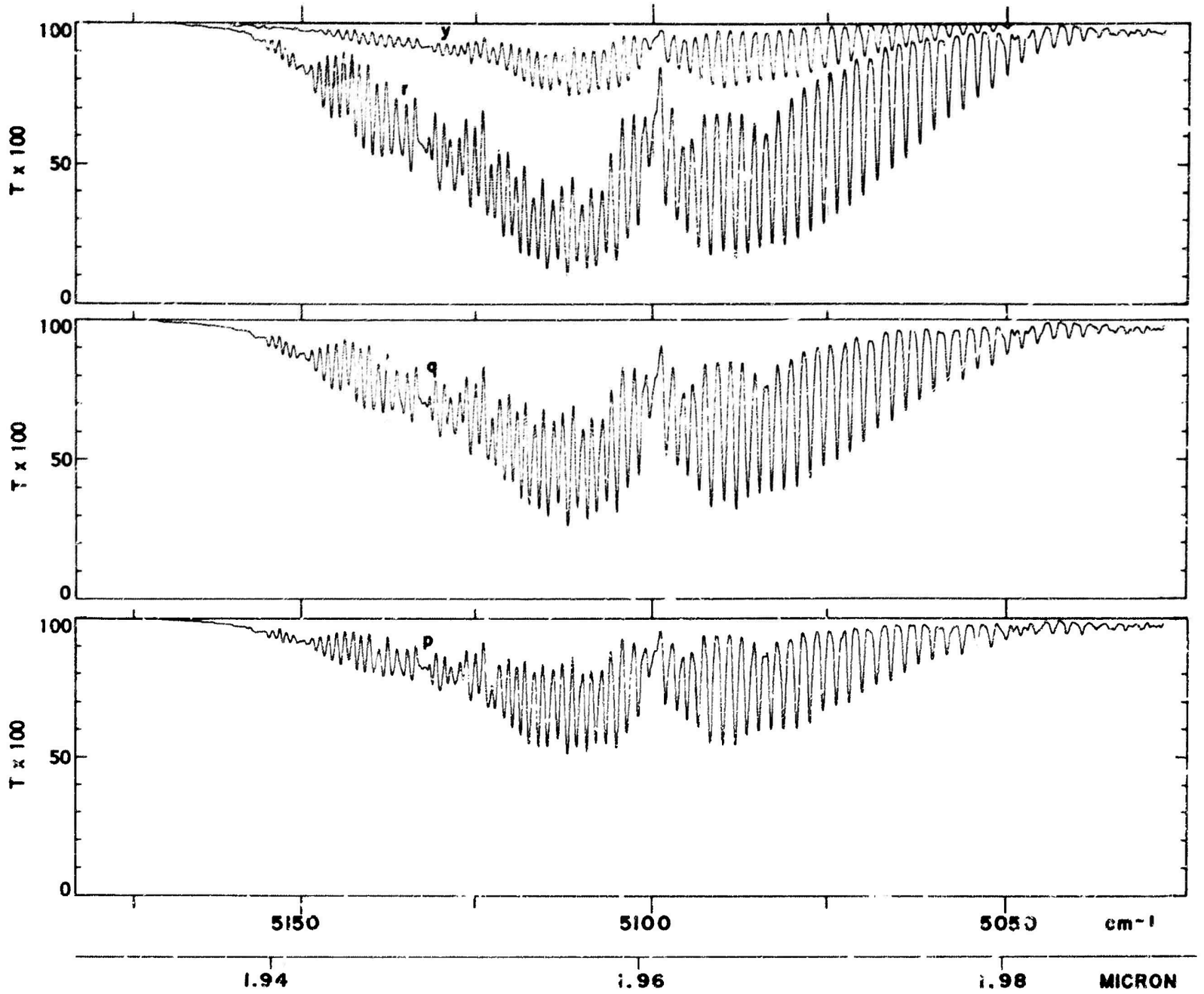
119
118
117
116
115
114
113
112
111
110
109
108
107
106
105
104
103
102
101
100
99
L*
od
cb
s
5150
5100
5050
cm-1
1.94
1.96
1.98
MICRON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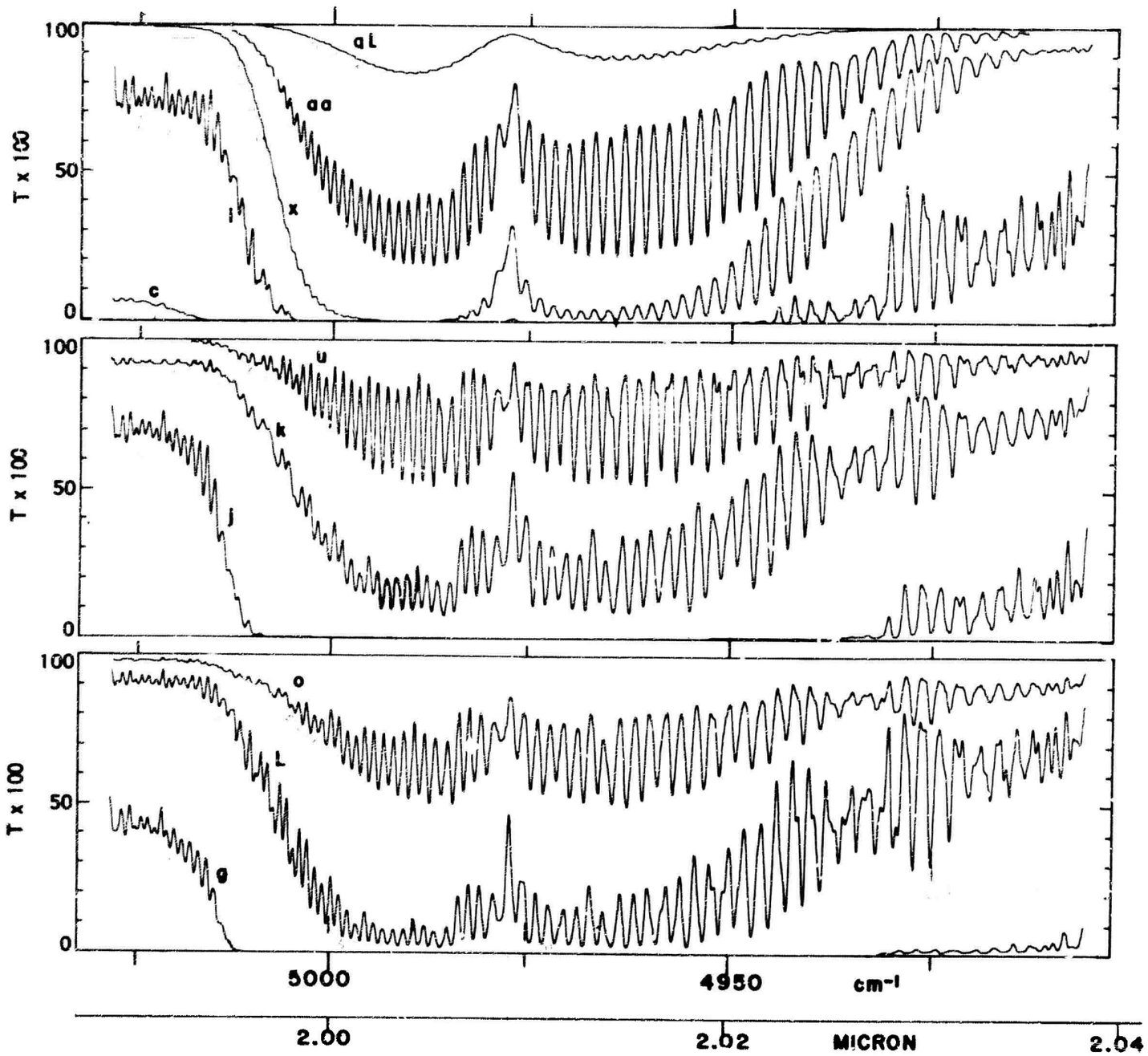
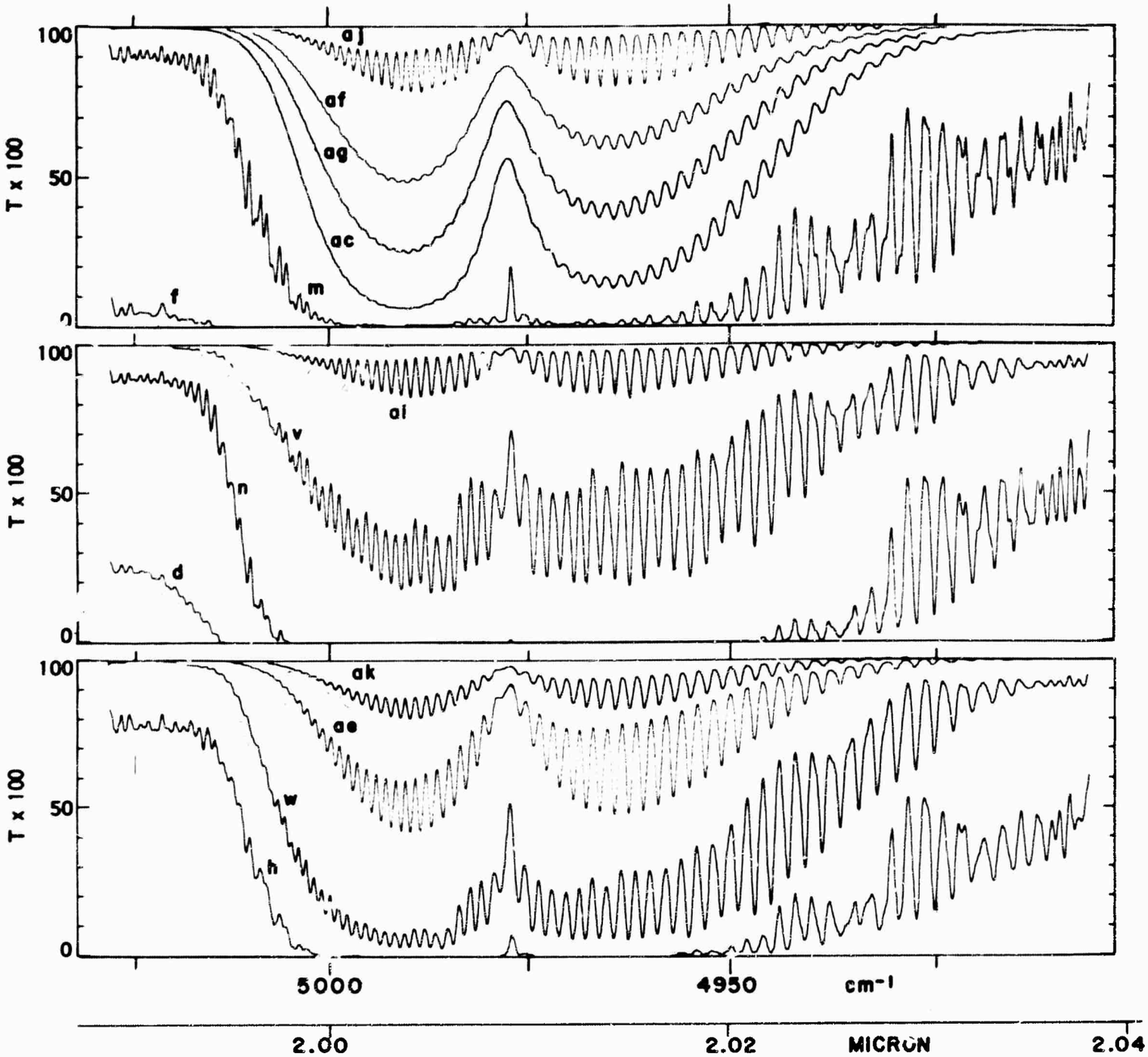
y
r
q
p
5150
5100
5050
cm-1
1.94
1.96
1.98
MICRON


100
50
0
T x 100
aL
aa
x
c
u
k
j
o
L
g
5000
4950
cm-1
2.00
2.02
MICRON
2.04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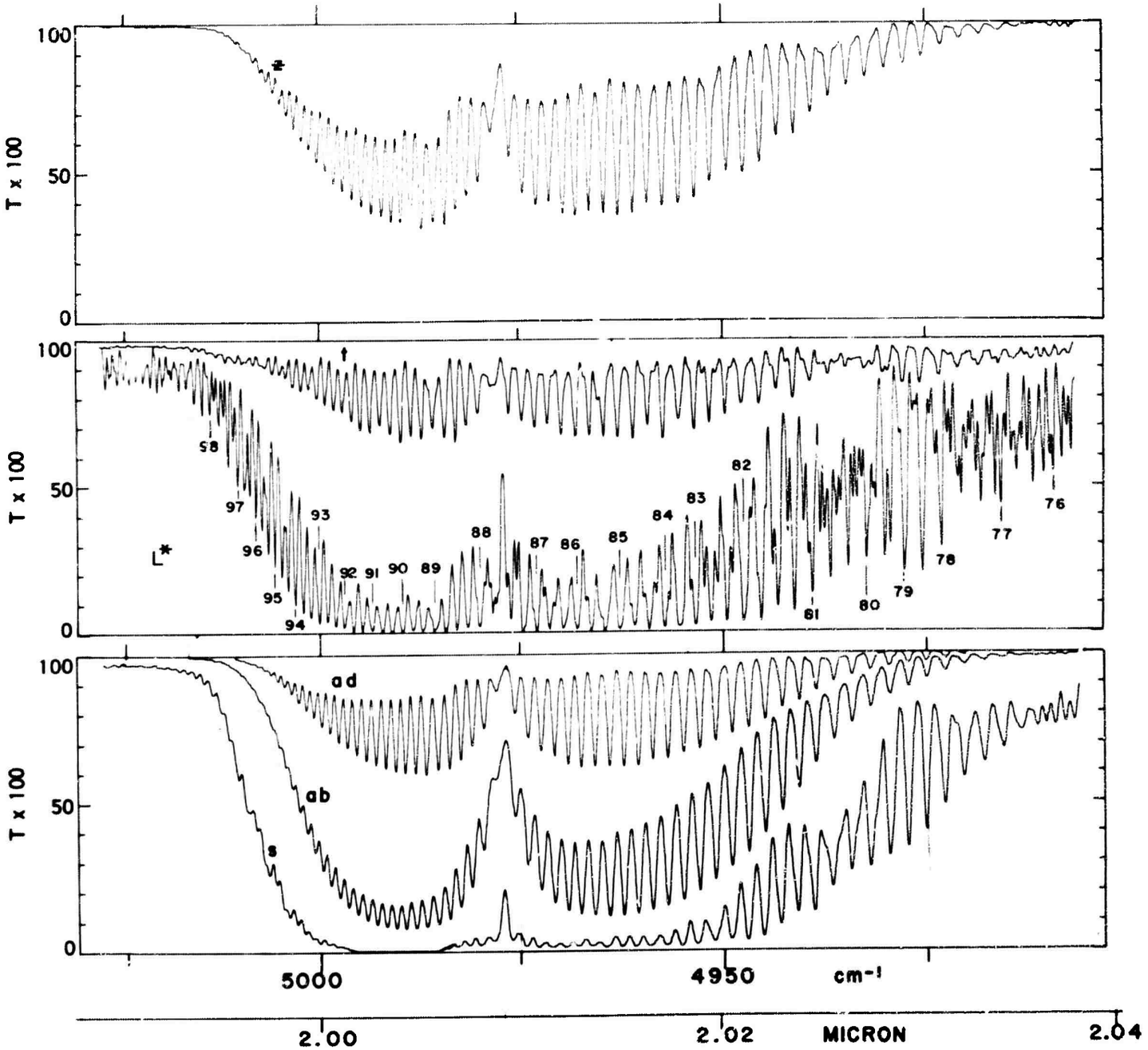
50
0
T x 100
aj
af
ag
ac
m
f
ai
v
n
d
ak
ae
w
h
5000
4950
cm-1
2.00
2.02
MICRON
2.04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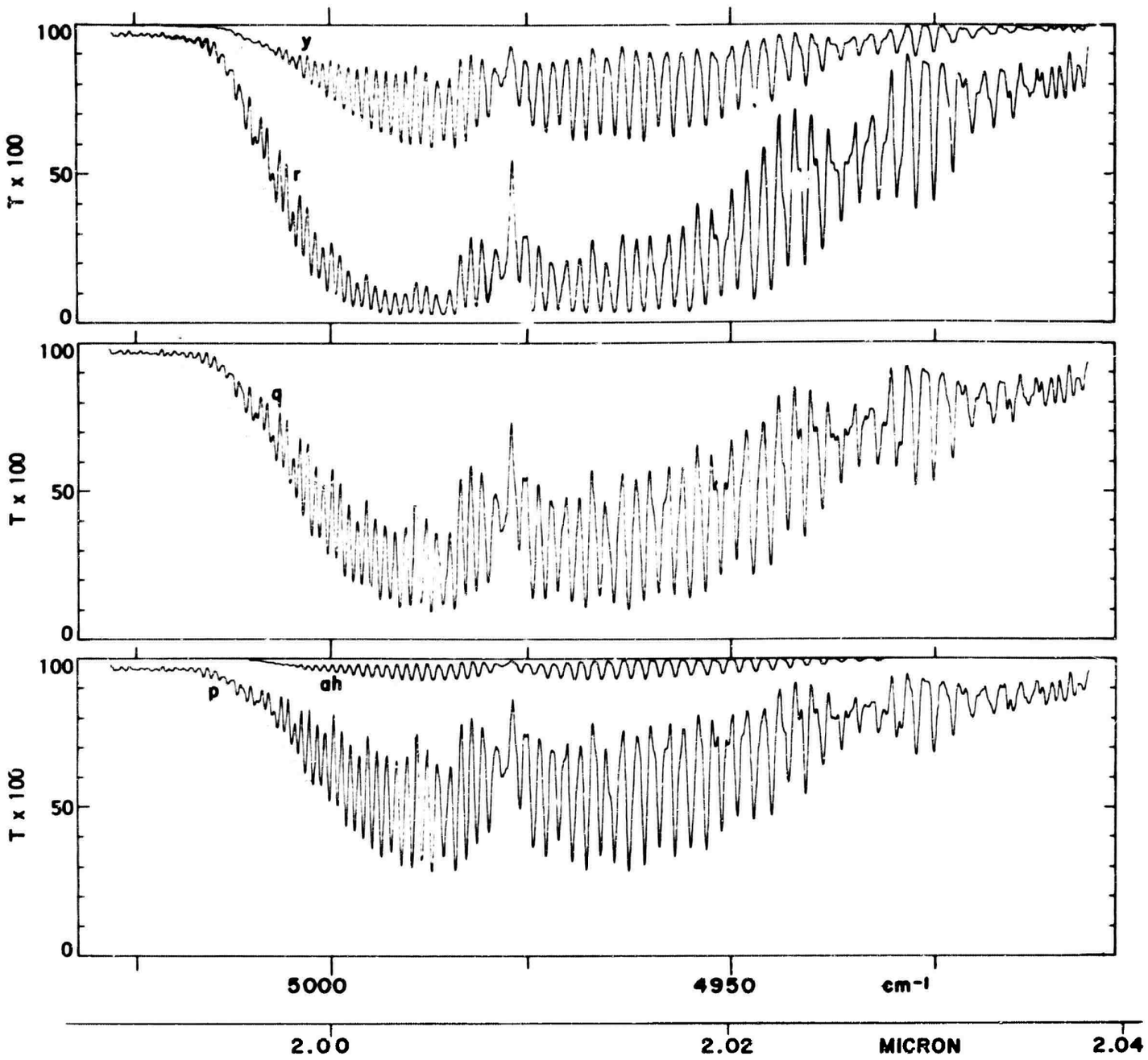
0
T x 100
58
97
96
95
94
93
92
91
90
89
88
87
86
85
84
83
82
81
80
79
78
77
76
ad
ab
s
5000
4950
cm-1
2.00
2.02
MICRON
2.04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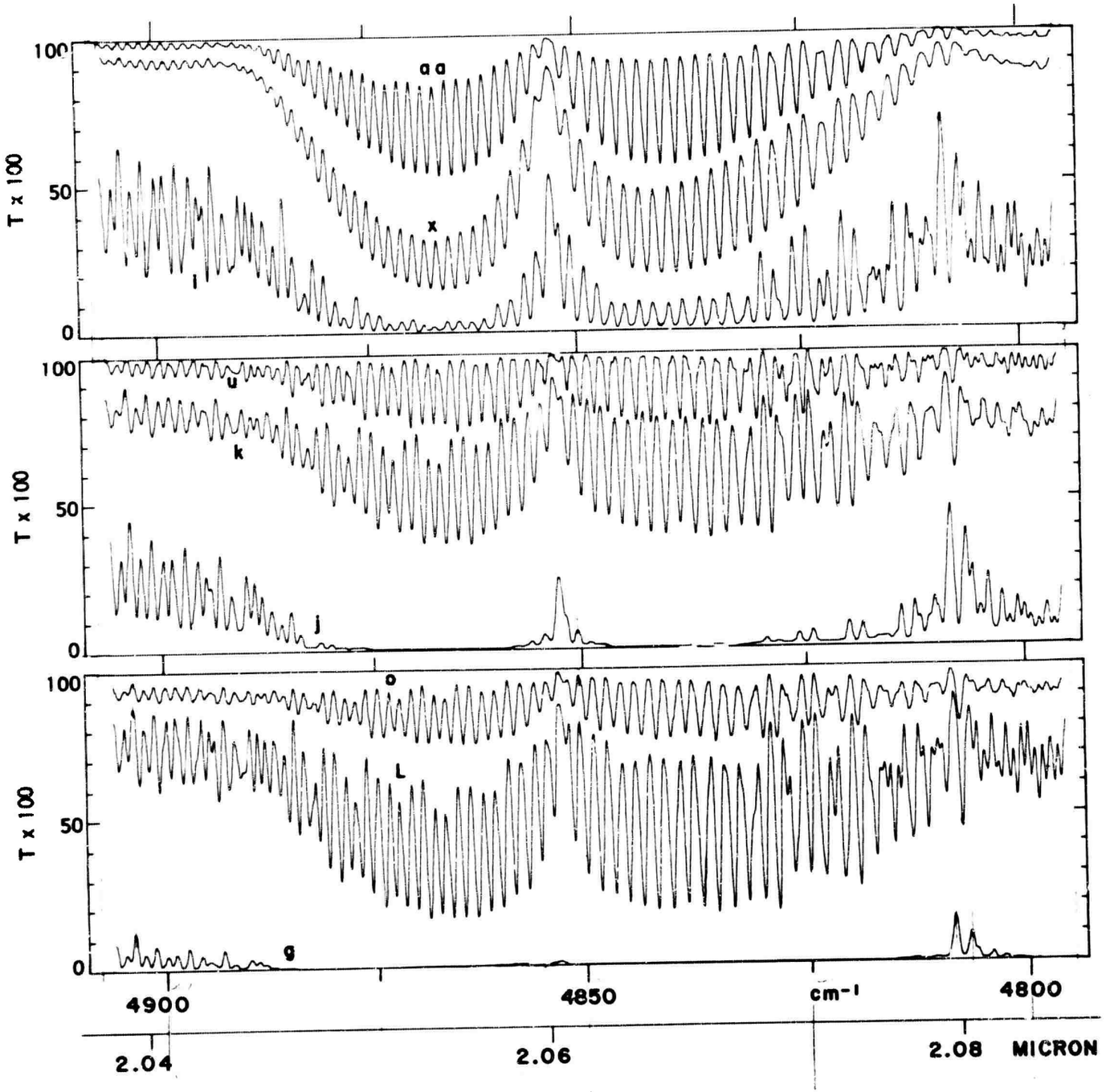
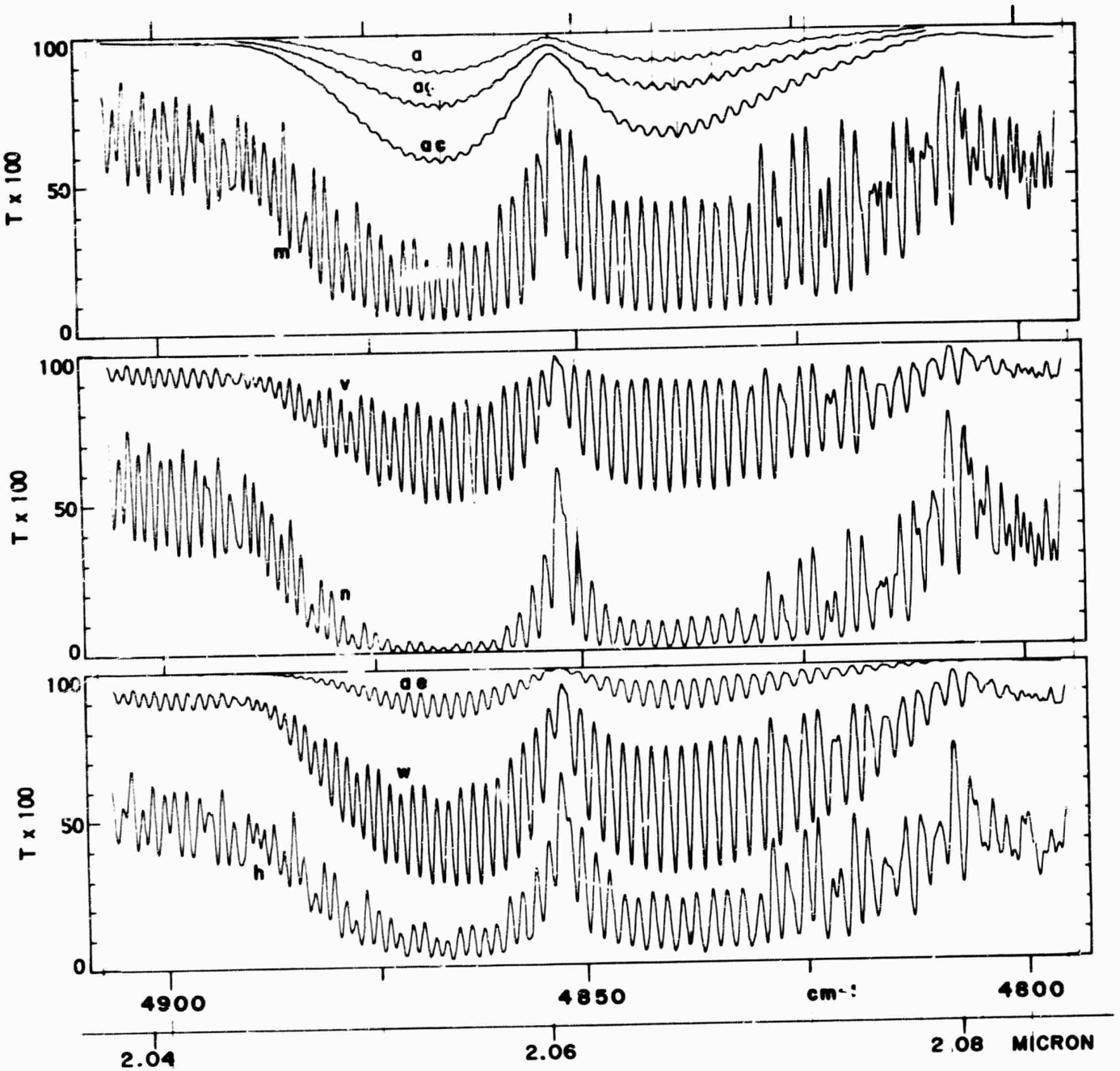
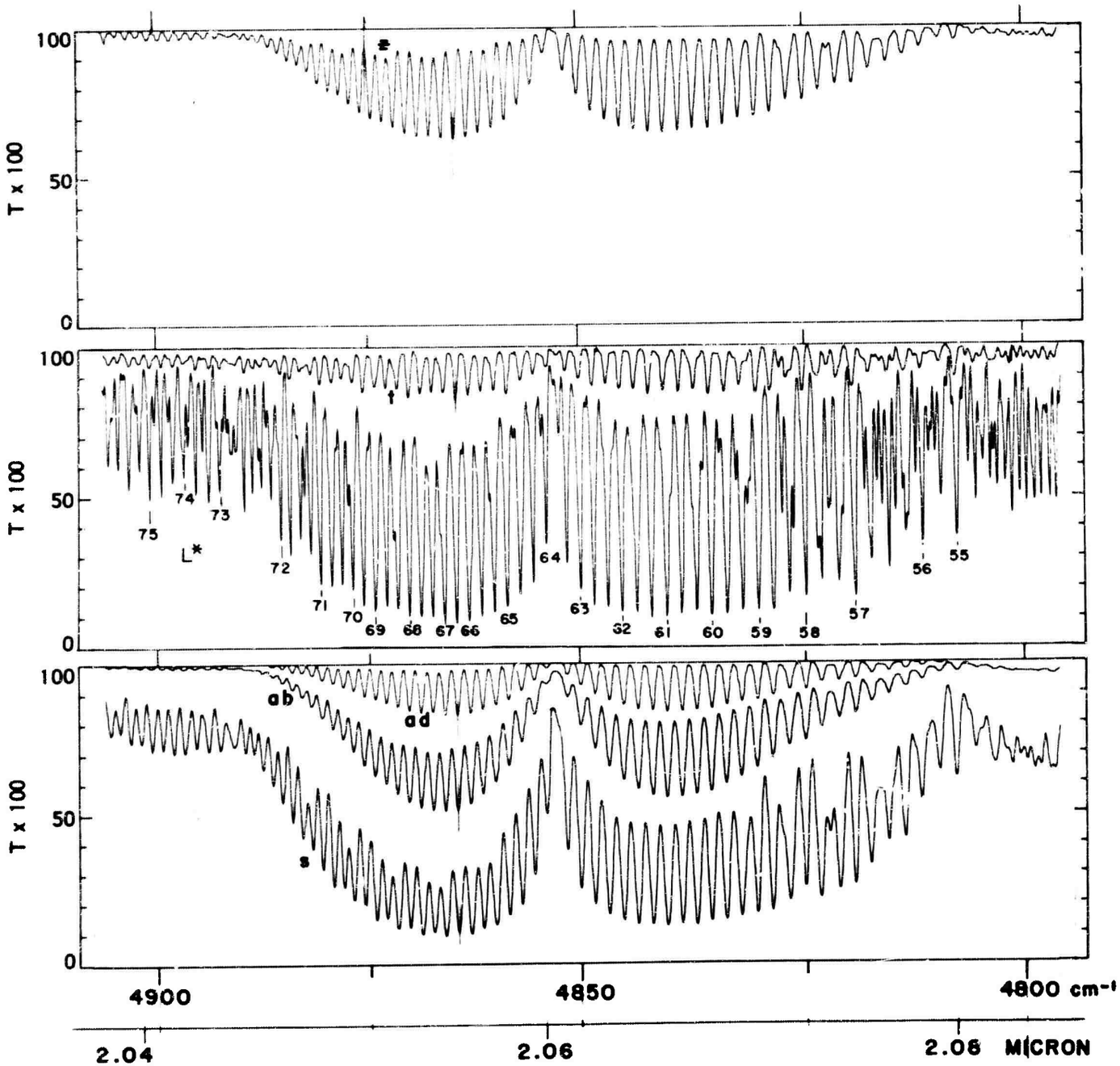
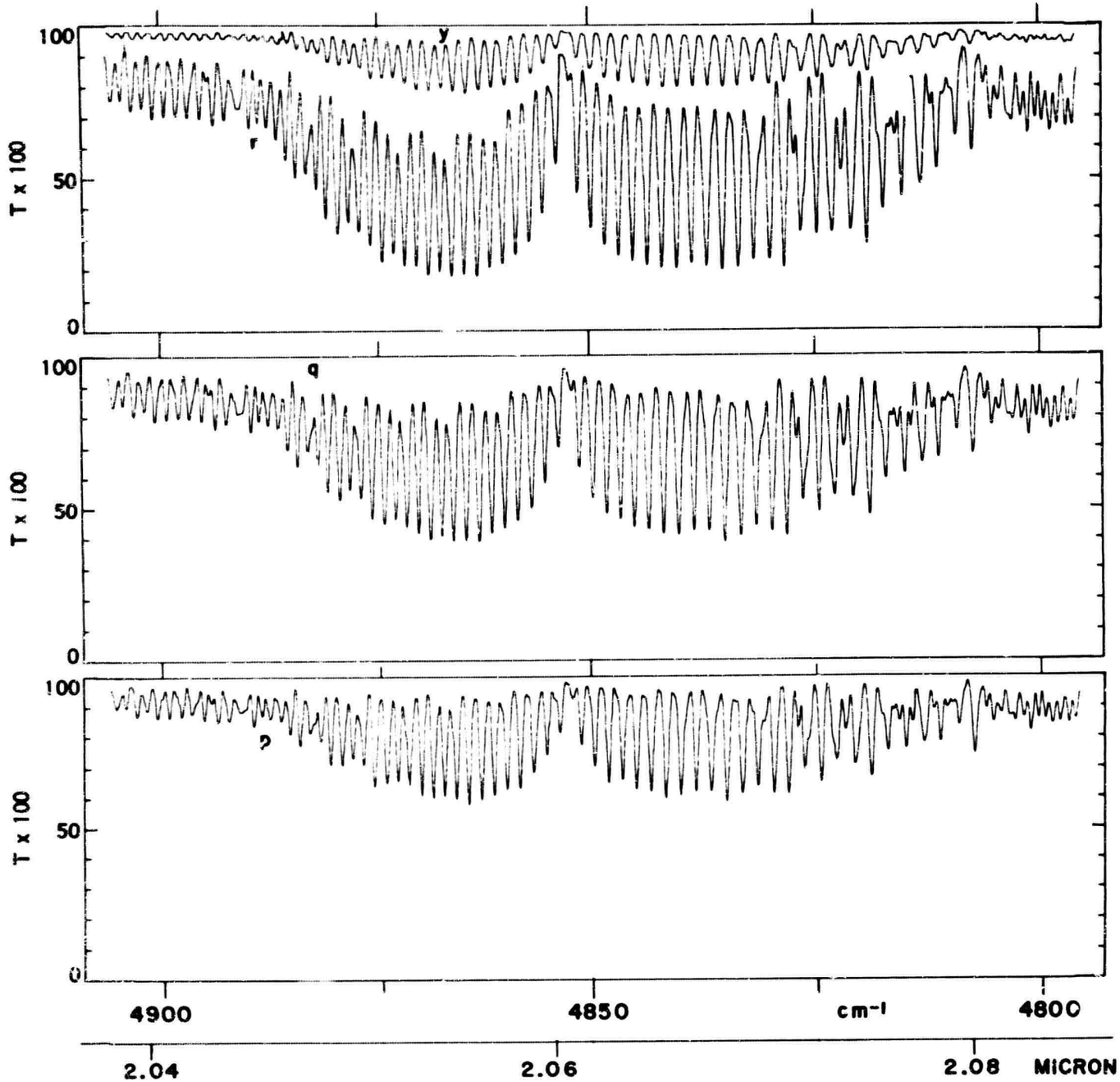
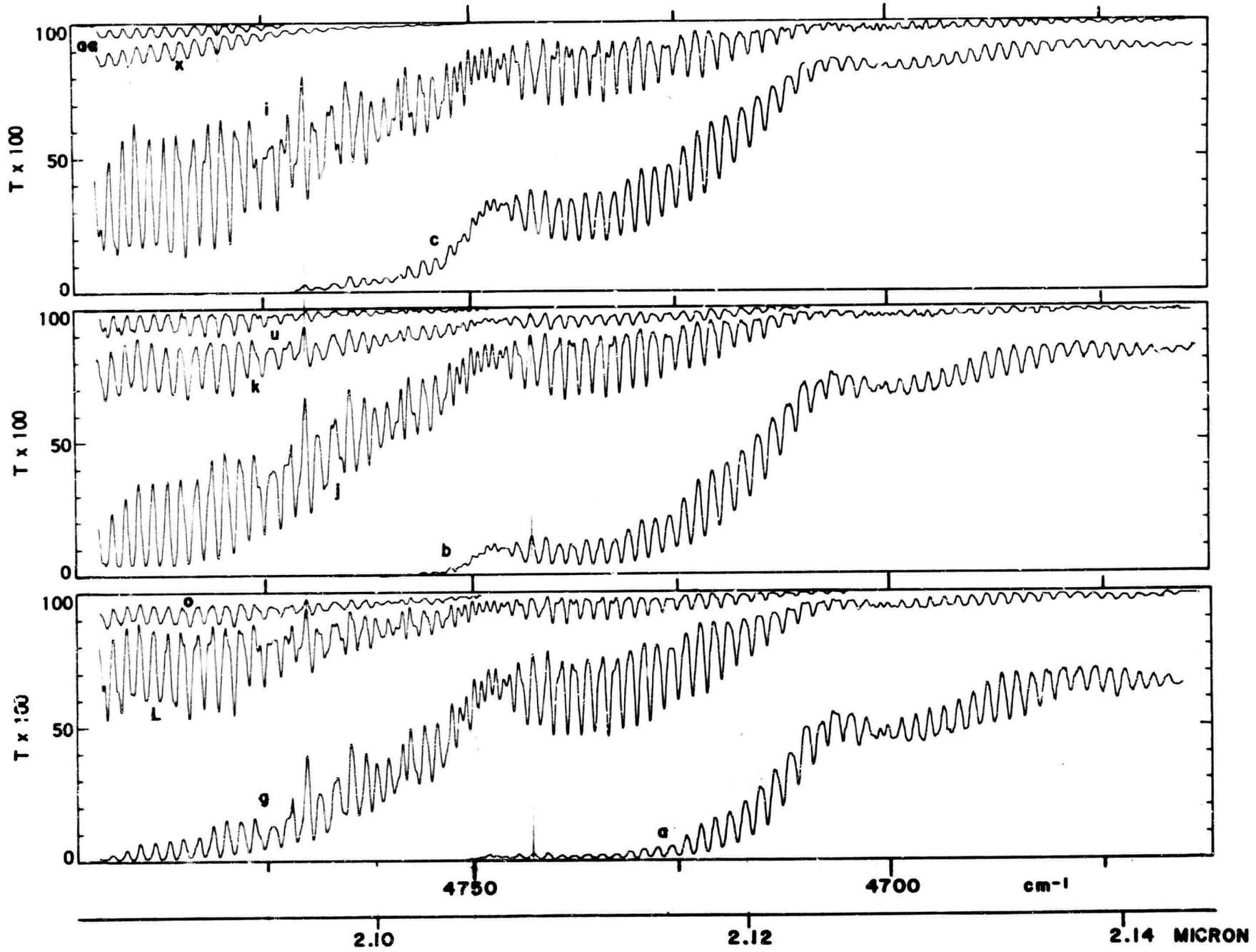
50
0
T x 100
y
r
q
p
ah
5000
4950
cm-1
2.00
2.02
MICRON
2.04

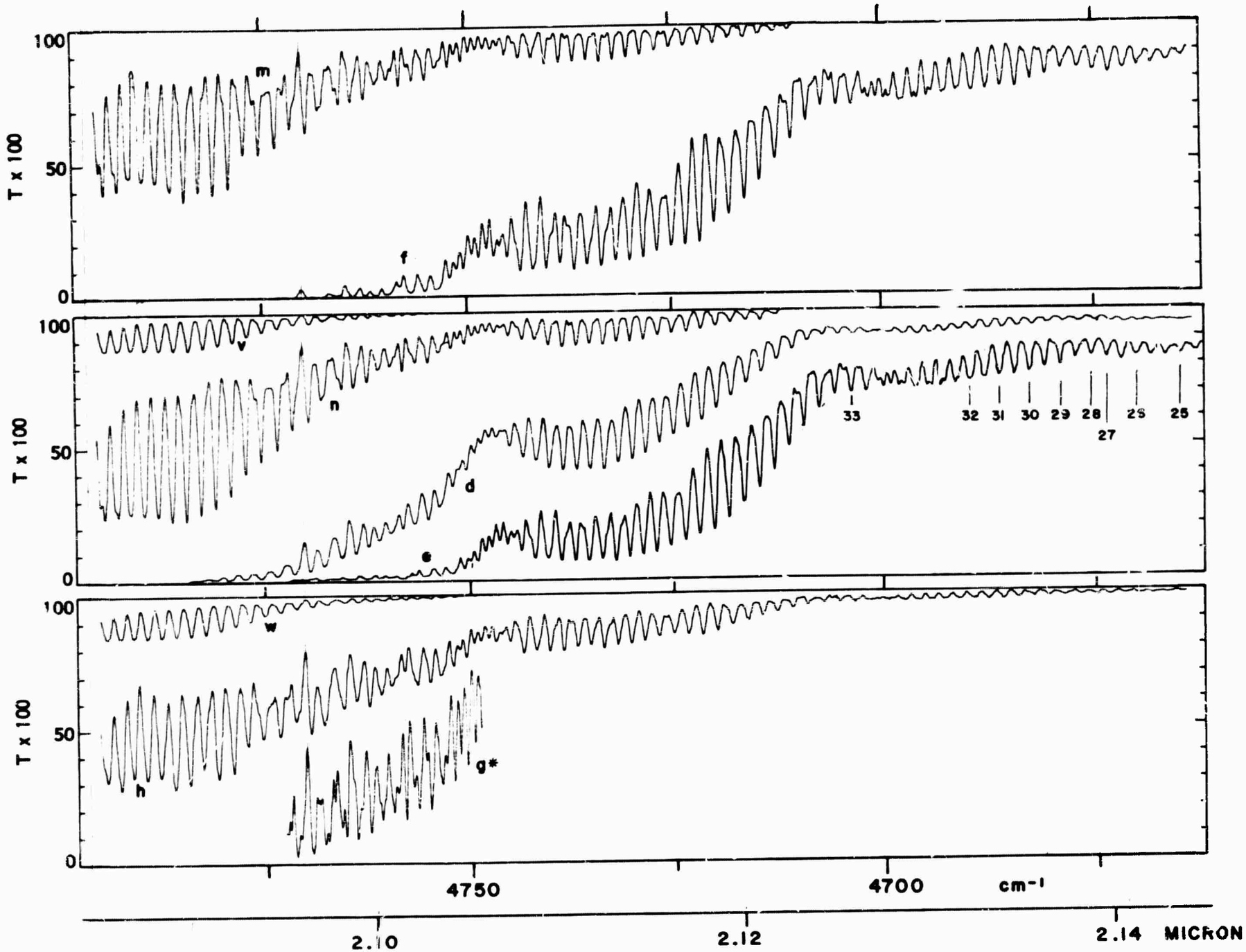

100
50
0
T x 100
aa
x
i
u
k
j
o
L
g
4900
4850
cm-1
4800
2.04
2.06
2.08 MICRON

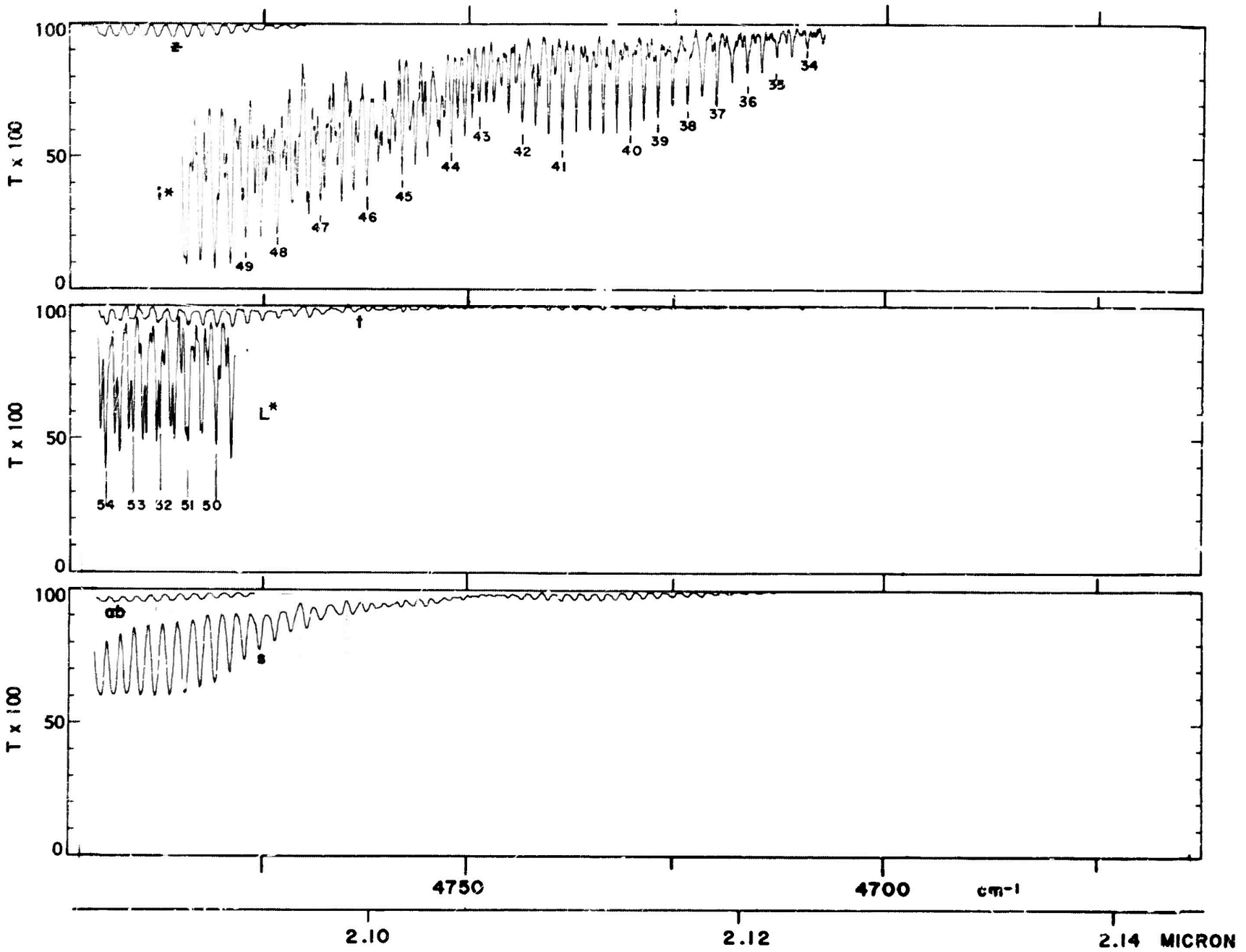

100
50
0
T x 100
a
ac
m
v
n
ae
w
h
4900
4850
cm⁻¹
4800
2.04
2.06
2.08 MICRON

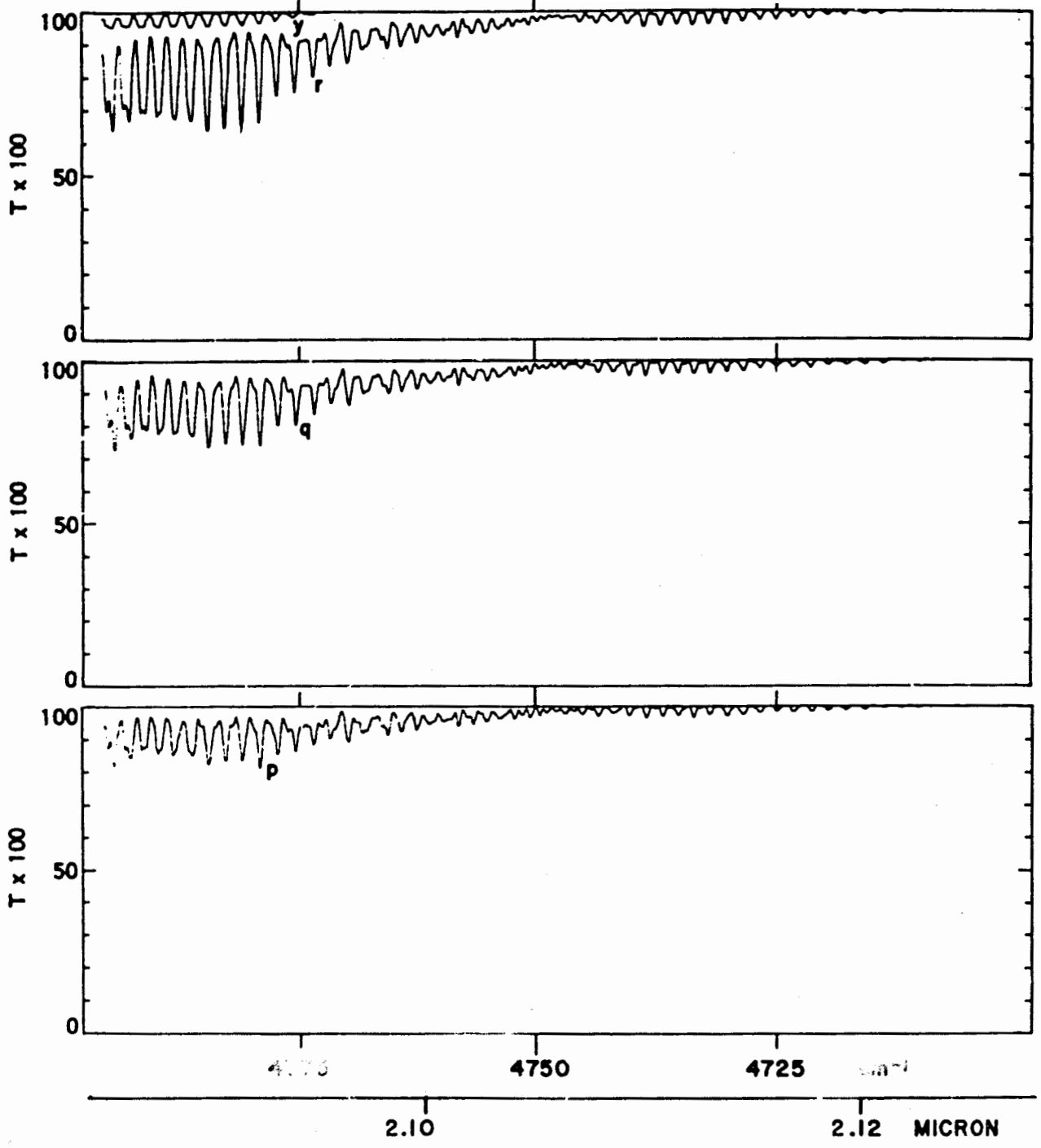

100
50
0
T x 100
L*
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
60
59
58
57
56
55
ab
ad
s
4900
4850
4800 cm⁻¹
2.04
2.06
2.08 MICRON

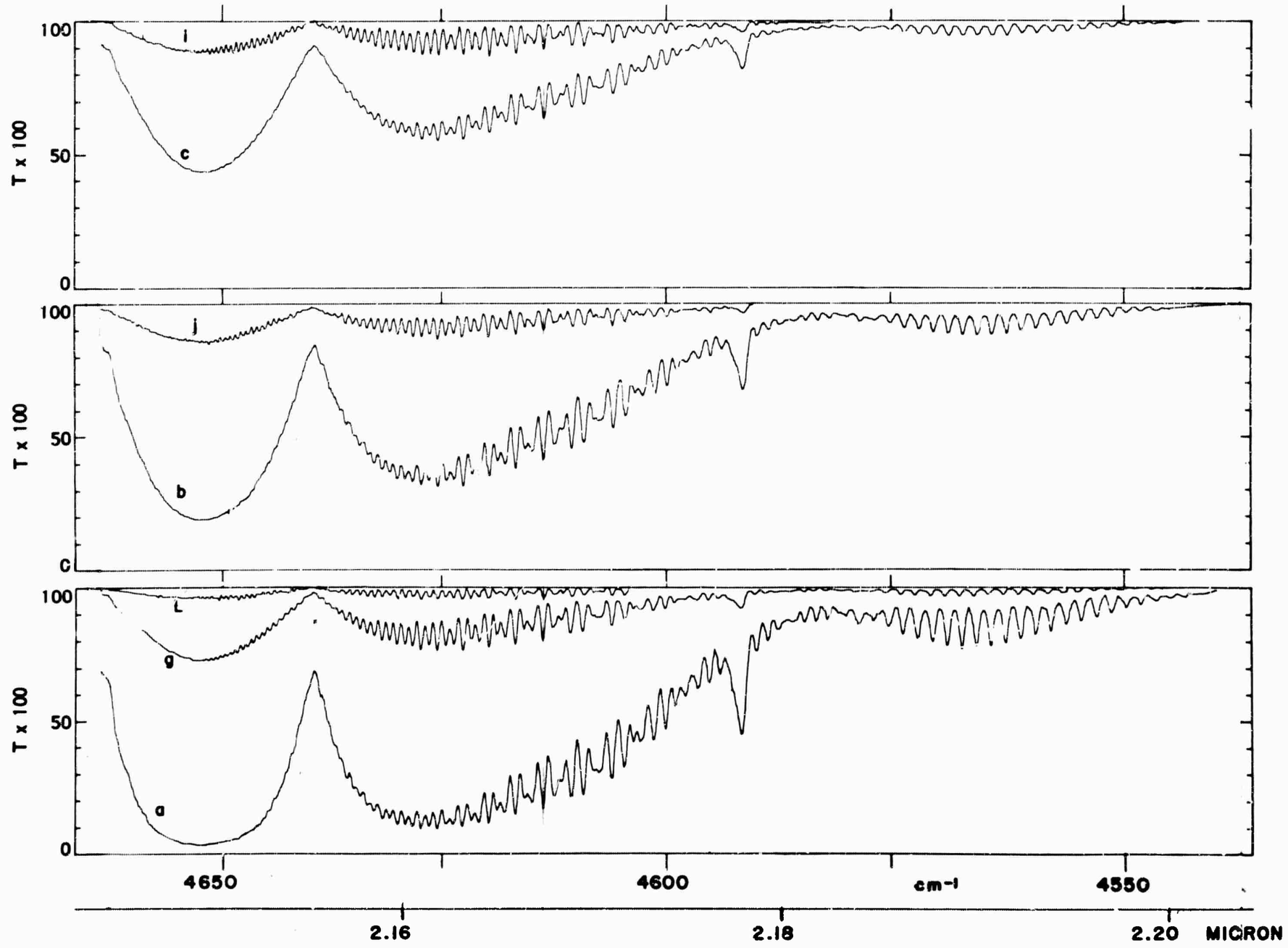

100
50
0
T x 100
y
q
p
4900
4850
cm-1
4800
2.04
2.06
2.08
MICRON


100
50
0
T x 100
aa
x
i
c
u
k
j
b
o
L
g
a
4750
4700
cm-1
2.10
2.12
2.14 MICRON


100
50
0
T x 100
m
f
v
n
d
e
33
32
31
30
29
28
27
26
25
w
h
g*
4750
4700
cm-1
2.10
2.12
2.14
MICRON


100
50
0
T x 100
e
i*
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
f
L*
54
53
32
51
50
ab
g
4750
4700
cm-1
2.10
2.12
2.14 MICRON


100
50
0
T x 100
y
r
q
p
4750
4725
2.10
2.12
MICRON


100
50
0
T x 100
i
c
j
b
L
g
a
4650
4600
cm-1
4550
2.16
2.18
2.20
MICRON

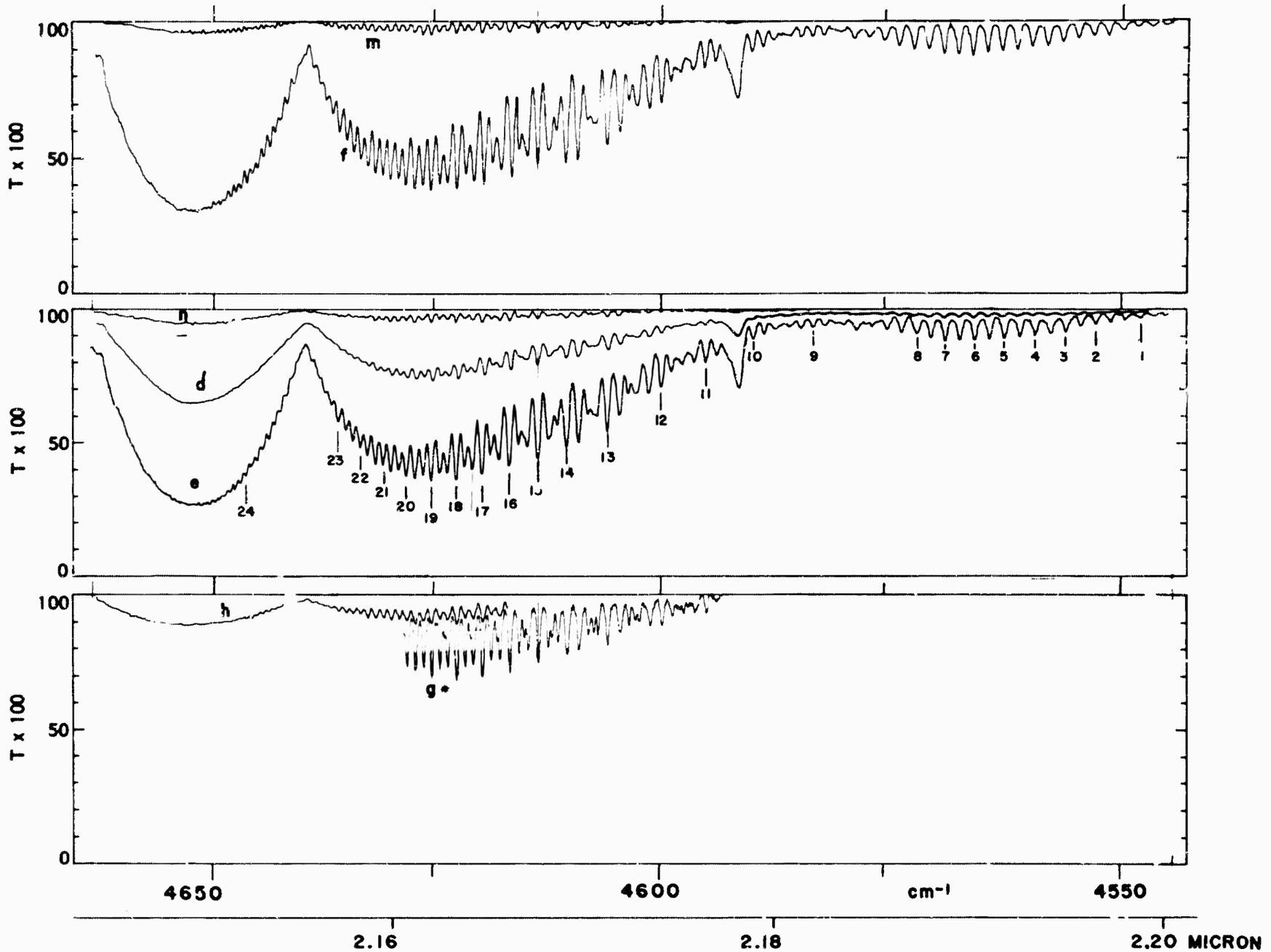

100
50
0
T x 100
m
f
n
d
e
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
h
g
4650
4600
cm-1
4550
2.16
2.18
2.20 MICRON

TABLE 5-1

CALIBRATION TABLE

Line No.	ν cm^{-1}	Line No.	ν cm^{-1}	Line No.	ν cm^{-1}	Line No.	ν cm^{-1}	Line No.	ν cm^{-1}
1	4548.1	36	4716.3	71	4880.7	106	5066.2	141	5206.6H
2	4553.0	37	4719.9	72	4885.4	107	5070.1	142	5218.4H
3	4556.2	38	4723.4	73	4892.8	108	5073.9	143	5225.3H
4	4559.4	39	4726.8	74	4896.9	109	5077.6	144	5236.9
5	4562.6	40	4730.2	75	4900.9	110	5081.2	145	5254.8H
6	4565.8	41	4738.5	76	4909.1	111	5084.8	146	5264.1H
7	4569.0	42	4743.3	77	4915.1	112	5088.2	147	5270.7
8	4572.1	43	4748.8	78	4922.8	113	5091.6	148	5275.7
9	4583.2	44	4751.8	79	4927.5	114	5094.9	149	5282.8
10	4589.6	45	4757.9	80	4932.1	115	5098.1	150	5287.4
11	4594.7	46	4762.3	81	4938.7	116	5101.9	151	5293.8
12	4599.7	47	4767.8	82	4947.1	117	5104.9	152	5297.9
13	4605.6	48	4773.3	83	4953.2	118	5107.8	153	5301.9
14	4610.1	49	4777.2	84	4957.0	119	5110.7	154	5305.6
15	4613.4	50	4780.9	85	4962.6	120	5113.4	155	5318.0
16	4616.6	51	4784.4	86	4967.9	121	5116.1	156	5320.8
17	4619.6	52	4787.9	87	4973.0	122	5118.6	157	5323.5
18	4622.6	53	4791.4	88	4980.1	123	5121.1	158	5326.0
19	4625.4	54	4794.7	89	4985.9	124	5123.5	159	5329.5
20	4628.1	55	4807.4	90	4989.9	125	5125.9	160	5333.4
21	4630.8	56	4811.4	91	4993.7	126	5130.3	161	5344.9H
22	4633.3	57	4819.1	92	4997.2	127	5134.5	162	5348.7H
23	4635.7	58	4824.7	93	5000.4	128	5137.2	163	5364.2H
24	4646.3	59	4830.2	94	5003.4	129	5139.8	164	5377.0H
25	4666.6	60	4835.5	95	5006.1	130	5142.4		
26	4671.6	61	4840.6	96	5008.5	131	5144.8		
27	4675.1	62	4845.6	97	5010.7	132	5147.1		
28	4676.9	63	4850.4	98	5014.2	133	5151.9		
29	4680.6	64	4854.4	99	5037.3	134	5154.1		
30	4684.1	65	4858.9	100	5041.6	135	5159.4		
31	4687.6	66	4863.3	101	5045.9	136	5163.7H		
32	4691.0	67	4866.2	102	5050.1	137	5170.5H		
33	4705.3	68	4870.4	103	5054.2	138	5176.2H		
34	4709.1	69	4874.4	104	5058.3	139	5180.6H		
35	4712.7	70	4877.0	105	5062.3	140	5184.9H		

[H]The calibration lines designated with an H are taken from H_2O; while the remainder are from CO_2.

SECTION 6

TABLE OF TRANSMITTANCES

Table 6-1 consists of values of transmittance, in percent, recorded at intervals of 0.1 cm^{-1} in the region from 4536 to 5362 cm^{-1}. The interval is sufficiently small that the original spectrum could be approximated very closely by plotting the tabulated values and joining the points with straight lines. The first column gives the wavenumber in cm^{-1}, and the second column gives the corresponding wavelength in microns. The tables were made by photographing a portion of the computer output which was obtained from the spectra by the technique described in Appendix C.

The CO_2 partial pressure p, the equivalent pressure P_e and the absorber thickness u for each sample are shown at the top of the column corresponding to that sample. These sample parameters are repeated on alternate pages for convenience. Each sample is designated by the same letter as in Table 4-1 and in the spectra in Section 5.

Values of transmittance are not tabulated over the entire spectral region for several of the smaller samples since the absorptance in some portions is very small. All tabulated values for a given wavenumber appear on a single page. Several of the larger samples are opaque over rather wide spectral intervals; in such cases a note stating that T = 0 is included rather than repeating all the hundreds of zero's which would otherwise appear.

The wavenumbers of most of the line centers are accurate to $\pm$ 0.1 cm^{-1} in the tables. Only a few are in error by more than 0.2 cm^{-1}.

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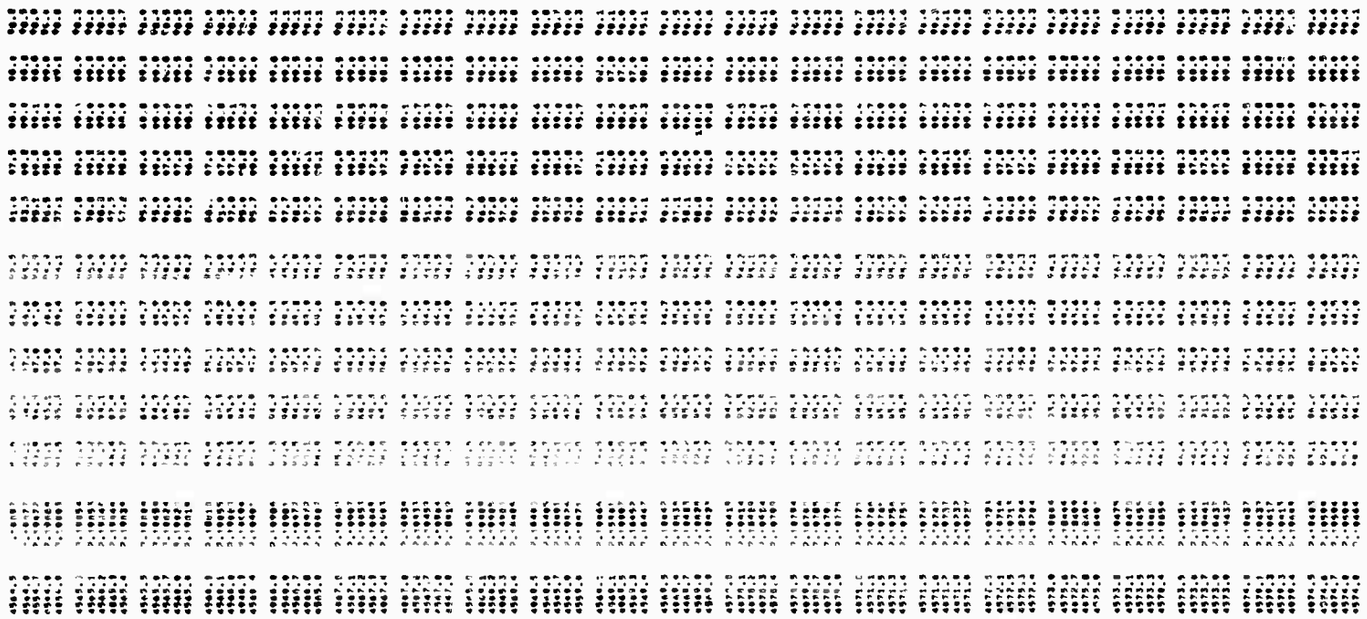
Table 6-1

Sam. No.		a	b	c	d	e	f	g	h	i	j
p(atm)		2.50 ± 10^0	2.53 ± 10^0	8.11 ± 10^0	2.50 ± 10^0	2.00 ± 10^0	1.000 ± 10^0	1.000 ± 10^0	1.19 ± 10^{-1}	2.50 ± 10^{-1}	2.50 ± 10^{-1}
p_o(atm)		3.29 ± 10^0	3.32 ± 10^0	1.32 ± 10^0	1.29 ± 10^0	2.62 ± 10^0	1.31 ± 10^0	1.31 ± 10^0	1.50 ± 10^{-1}	3.00 ± 10^{-1}	9.99 ± 10^{-1}
o(atm cm) STP		2.17 ± 10^3	1.11 ± 10^3	5.57 ± 10^4	2.01 ± 10^4	8.71 ± 10^4	9.62 ± 10^4	2.10 ± 10^3	9.96 ± 10^3	9.95 ± 10^3	9.95 ± 10^3
ν (cm^{-1})	λ (micron)	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100
4838.0	2.2H459	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.1	2.2H456	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.2	2.2H453	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.3	2.2H450	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.4	2.2H447	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.5	2.2H444	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.6	2.2H441	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.7	2.2H438	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.8	2.2H435	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4838.9	2.2H432	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.0	2.2H429	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.1	2.2H426	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.2	2.2H423	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.3	2.2H420	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.4	2.2H417	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.5	2.2H414	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.6	2.2H411	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.7	2.2H408	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.8	2.2H405	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4839.9	2.2H402	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.0	2.2H399	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.1	2.2H396	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.2	2.2H393	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.3	2.2H390	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.4	2.2H387	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.5	2.2H384	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.6	2.2H381	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.7	2.2H378	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.8	2.2H375	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4840.9	2.2H372	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.0	2.2H369	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.1	2.2H366	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.2	2.2H363	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.3	2.2H360	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.4	2.2H357	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.5	2.2H354	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.6	2.2H351	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.7	2.2H348	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.8	2.2H345	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4841.9	2.2H342	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.0	2.2H339	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.1	2.2H336	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.2	2.2H333	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.3	2.2H330	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.4	2.2H327	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.5	2.2H324	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.6	2.2H321	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.7	2.2H318	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.8	2.2H315	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4842.9	2.2H312	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.0	2.2H309	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.1	2.2H306	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.2	2.2H303	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.3	2.2H300	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.4	2.2H297	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.5	2.2H294	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.6	2.2H291	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.7	2.2H288	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.8	2.2H285	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4843.9	2.2H282	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.0	2.2H279	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.1	2.2H276	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.2	2.2H273	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.3	2.2H270	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.4	2.2H267	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.5	2.2H264	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.6	2.2H261	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.7	2.2H258	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.8	2.2H255	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0
4844.9	2.2H252	110.8	109.5	148.0	148.0	194.0	100.0	000.0	100.0	100.0	000.0

Sam. No.		A	b	c	d	e	f	g	h	i	j
p(atm)		2.50 ± 10^0	9.53 ± 10^0	9.53 ± 10^0	8.50 ± 10^0	9.00 ± 10^0	1.000 ± 10^0	1.000 ± 10^0	1.16 ± 10^{-1}	9.30 ± 10^{-1}	9.20 ± 10^{-1}
P_o(atm)		1.29 ± 10^0	1.26 ± 10^0	1.26 ± 10^0	1.29 ± 10^0	9.66 ± 10^0	1.31 ± 10^0	1.31 ± 10^0	1.50 ± 10^{-1}	1.00 ± 10^{-1}	9.99 ± 10^{-1}
o(atm cm) STP		2.17 ± 10^3	1.15 ± 10^3	5.57 ± 10^4	2.01 ± 10^4	9.71 ± 10^4	9.05 ± 10^4	9.15 ± 10^3	9.96 ± 10^3	9.95 ± 10^3	9.95 ± 10^3
ν (cm^{-1})	λ (micron)	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100	T ± 100
4895.5	2.0919	94.5	47.8	98.4	98.1	94.8	98.0	98.0	98.0	98.0	98.0
4895.6	2.0951	91.9	94.7	99.4	99.8	94.1	99.0	99.0	98.0	98.0	98.0
4895.7	2.0948	92.4	96.2	97.9	99.4	94.1	99.1	99.0	98.0	98.0	98.0
4895.8	2.0945	91.9	95.9	97.2	99.8	94.8	97.4	99.0	99.0	98.0	98.0
4895.9	2.0942	93.4	96.4	98.0	99.7	94.1	99.0	99.0	99.0	98.0	98.0
4896.0	2.0940	93.0	95.8	98.4	99.8	95.0	99.0	99.0	99.0	98.0	98.0
4896.1	2.0937	92.4	96.2	98.7	99.8	95.6	99.0	99.0	99.1	98.0	98.0
4896.2	2.0934	94.0	95.6	98.9	99.8	94.6	99.0	99.0	99.0	98.0	98.0
4896.3	2.0931	94.0	95.9	98.7	99.8	95.2	99.0	99.0	99.0	98.0	98.0
4896.4	2.0929	94.5	96.1	97.4	99.8	95.9	99.0	99.0	99.0	98.0	98.0
4896.5	2.0926	91.7	96.5	96.8	99.0	96.9	99.0	99.0	99.2	98.0	98.0
4896.6	2.0923	93.8	95.8	98.2	99.8	96.4	99.0	99.0	99.0	98.0	98.0
4896.7	2.0920	93.8	96.7	98.3	99.8	96.0	99.0	99.0	99.5	98.0	98.0
4896.8	2.0917	94.0	97.1	98.4	99.8	96.4	99.0	99.0	99.0	98.0	98.0
4896.9	2.0915	94.5	97.1	98.4	99.8	96.4	99.0	99.0	99.0	98.0	98.0
4897.0	2.0912	94.7	96.9	98.4	99.8	96.1	99.0	99.0	99.0	98.0	98.0
4897.1	2.0909	91.9	96.7	98.4	99.8	95.9	99.0	99.0	99.0	98.0	98.0
4897.2	2.0906	91.4	96.8	98.4	99.8	96.2	99.0	99.0	99.0	98.0	98.0
4897.3	2.0904	93.0	95.5	98.0	99.8	96.4	99.0	99.0	99.0	98.0	98.0
4897.4	2.0901	91.6	96.8	97.4	99.8	96.2	99.1	99.0	99.0	98.0	98.0
4897.5	2.0898	88.5	94.9	98.9	99.1	93.5	96.1	99.0	99.4	98.0	98.0
4897.6	2.0896	87.4	95.9	98.5	99.0	93.8	96.0	99.0	99.0	98.0	98.0
4897.7	2.0893	88.7	95.1	98.1	99.0	94.0	95.9	99.0	99.0	98.0	98.0
4897.8	2.0890	88.1	95.1	98.1	99.0	94.0	96.2	99.0	99.0	98.0	98.0
4897.9	2.0888	87.4	95.0	98.1	99.0	94.2	96.1	99.0	99.0	98.0	98.0
4898.0	2.0885	87.9	95.0	98.4	99.0	94.1	96.1	99.0	99.0	98.0	98.0
4898.1	2.0883	87.4	95.2	97.8	99.0	94.3	96.0	99.0	99.0	98.0	98.0
4898.2	2.0880	87.4	95.2	98.0	99.0	94.3	96.0	99.0	99.0	98.0	98.0
4898.3	2.0877	87.4	95.2	98.0	99.0	94.3	96.0	99.0	99.0	98.0	98.0
4898.4	2.0875	87.4	95.2	98.0	99.0	94.3	96.0	99.0	99.0	98.0	98.0
4898.5	2.0872	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4898.6	2.0869	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4898.7	2.0867	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4898.8	2.0864	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4898.9	2.0861	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.0	2.0859	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.1	2.0856	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.2	2.0853	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.3	2.0851	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.4	2.0848	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.5	2.0845	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.6	2.0843	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.7	2.0840	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.8	2.0837	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4899.9	2.0835	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.0	2.0832	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.1	2.0829	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.2	2.0827	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.3	2.0824	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.4	2.0821	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.5	2.0819	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.6	2.0816	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.7	2.0813	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.8	2.0811	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4900.9	2.0808	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.0	2.0805	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.1	2.0803	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.2	2.0800	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.3	2.0797	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.4	2.0795	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.5	2.0792	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.6	2.0789	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.7	2.0787	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.8	2.0784	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4901.9	2.0781	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.0	2.0779	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.1	2.0776	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.2	2.0773	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.3	2.0771	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.4	2.0768	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.5	2.0765	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.6	2.0763	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.7	2.0760	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.8	2.0757	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4902.9	2.0755	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.0	2.0752	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.1	2.0749	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.2	2.0747	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.3	2.0744	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.4	2.0741	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.5	2.0739	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.6	2.0736	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.7	2.0733	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.8	2.0731	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4903.9	2.0728	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7
4904.0	2.0725	87.4	96.1	98.3	99.0	94.3	97.0	99.0	99.7	98.0	98.7



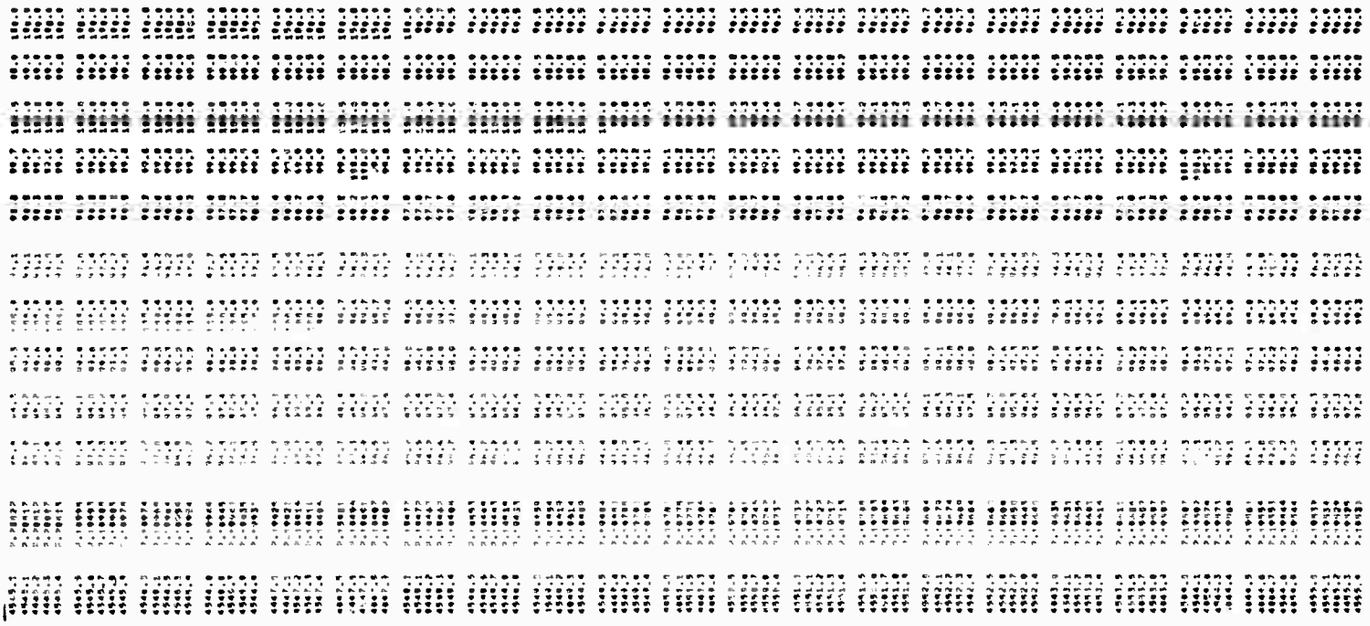


Table 6-1

Table 6-1 (continued)

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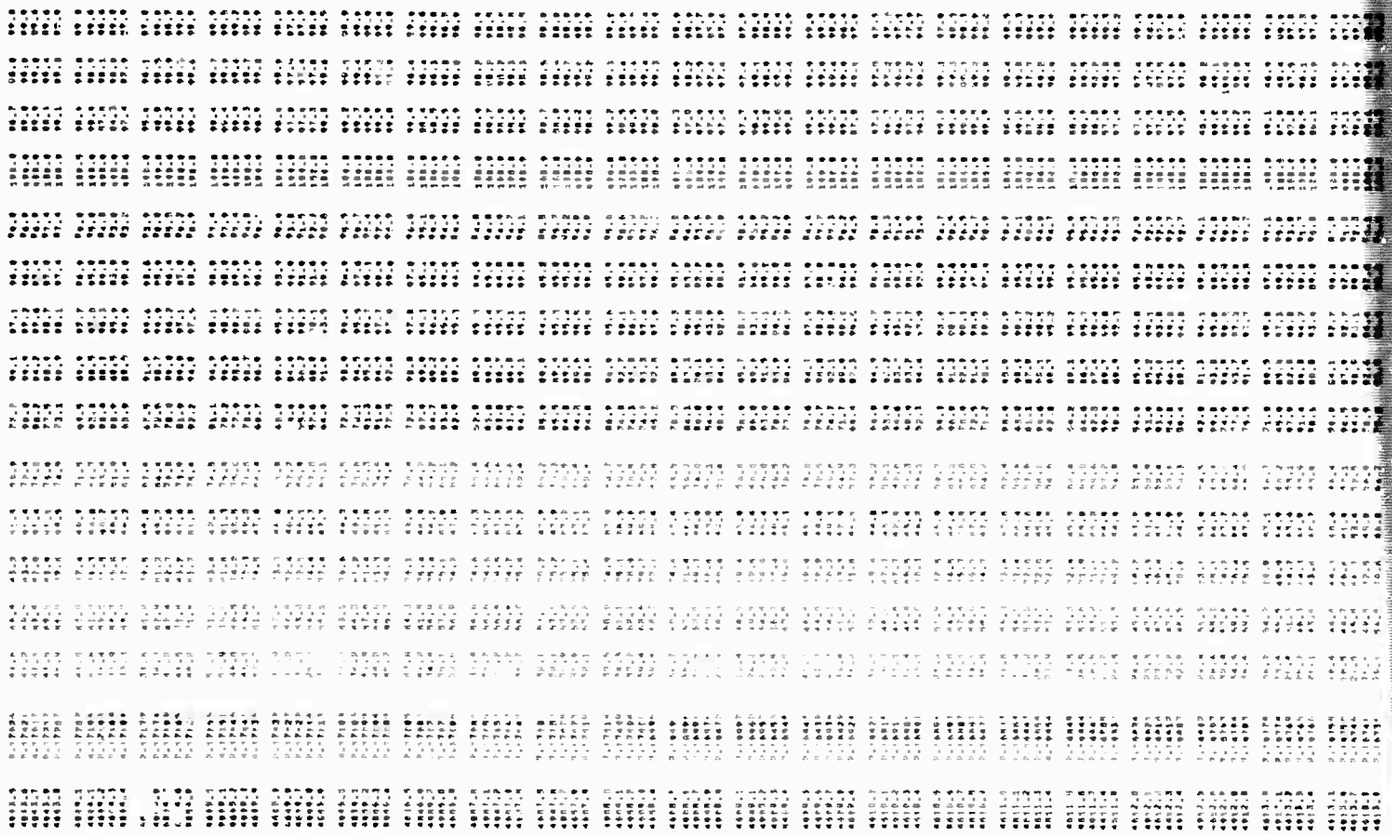


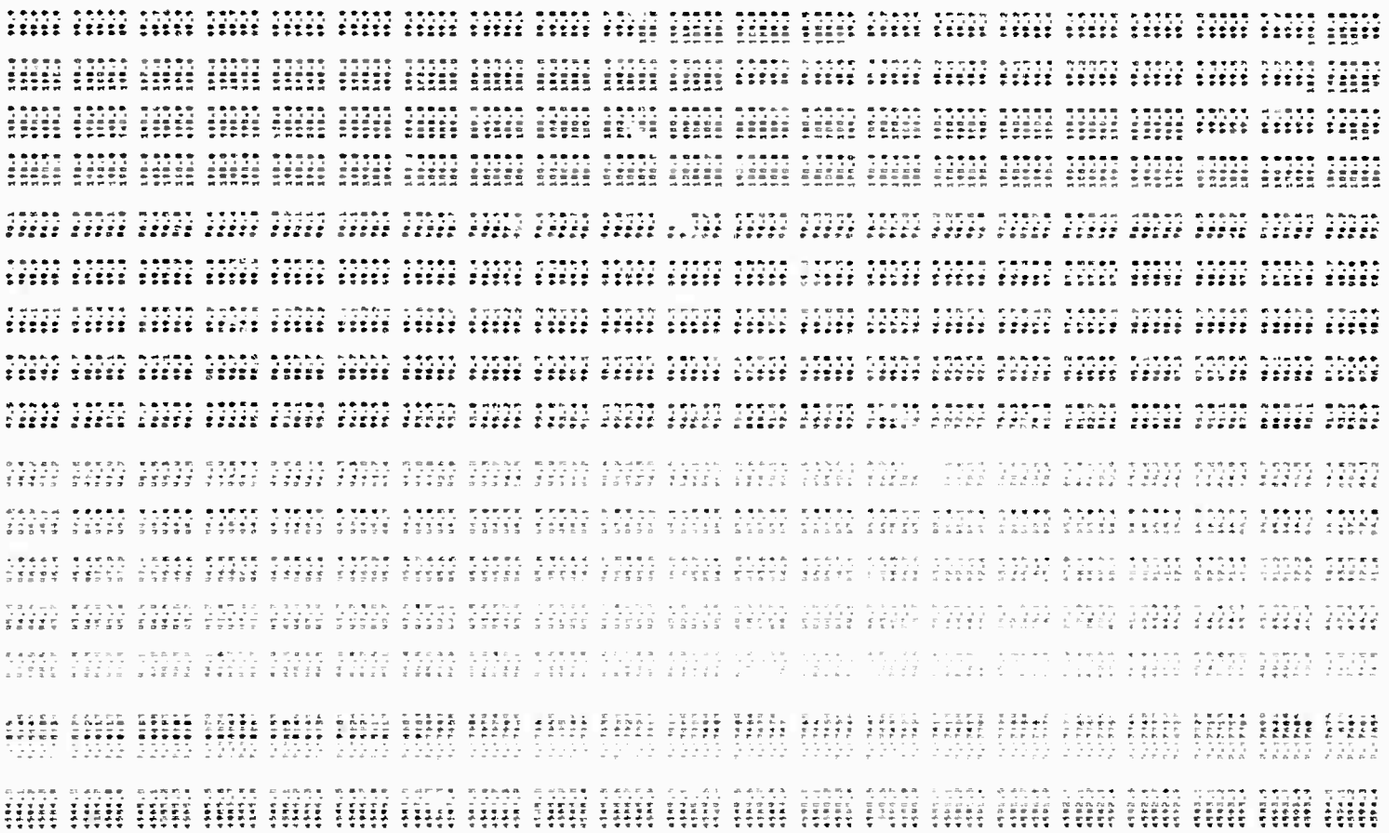
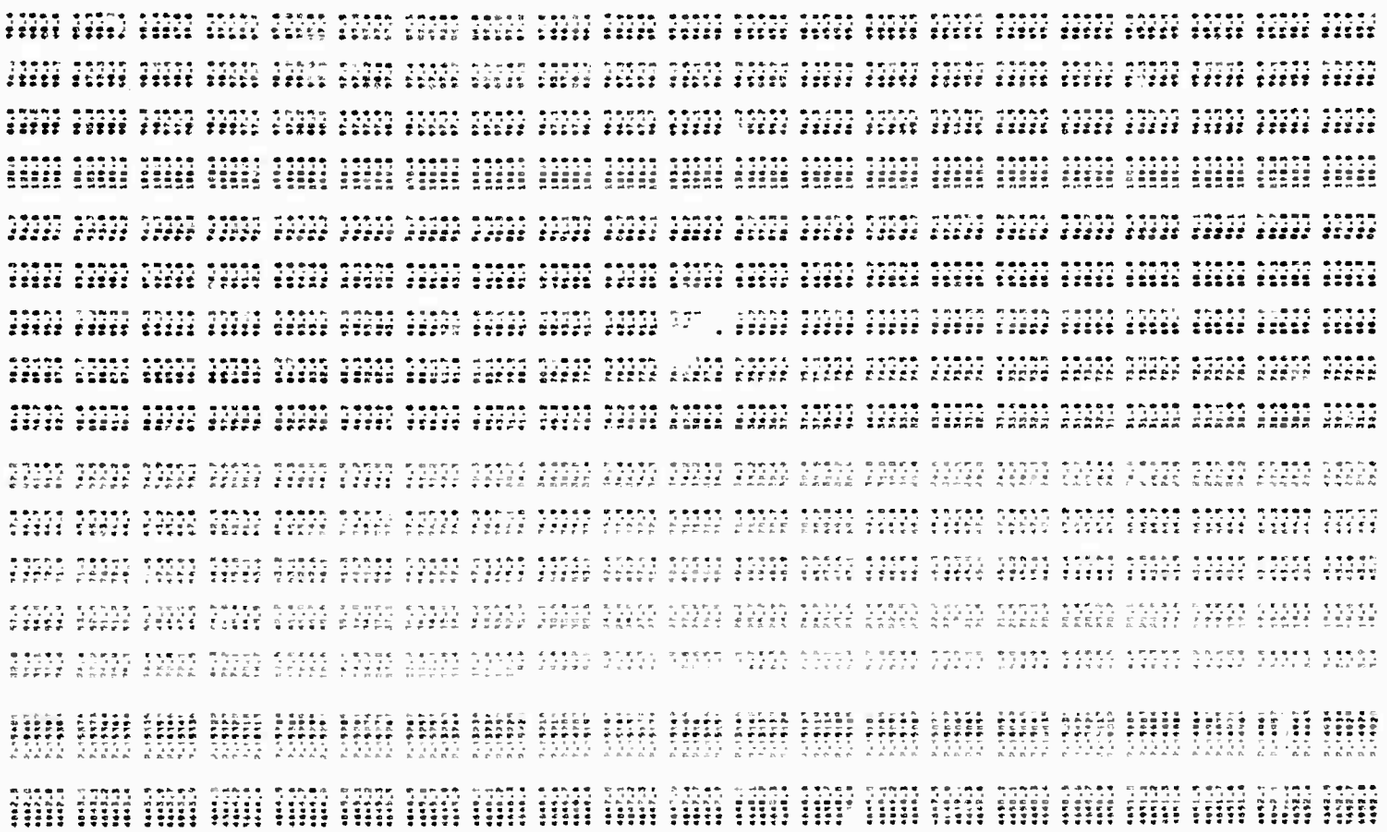


Table 6-1 (continued)

ν (cm⁻¹)	λ (microns)	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100	T ×100
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



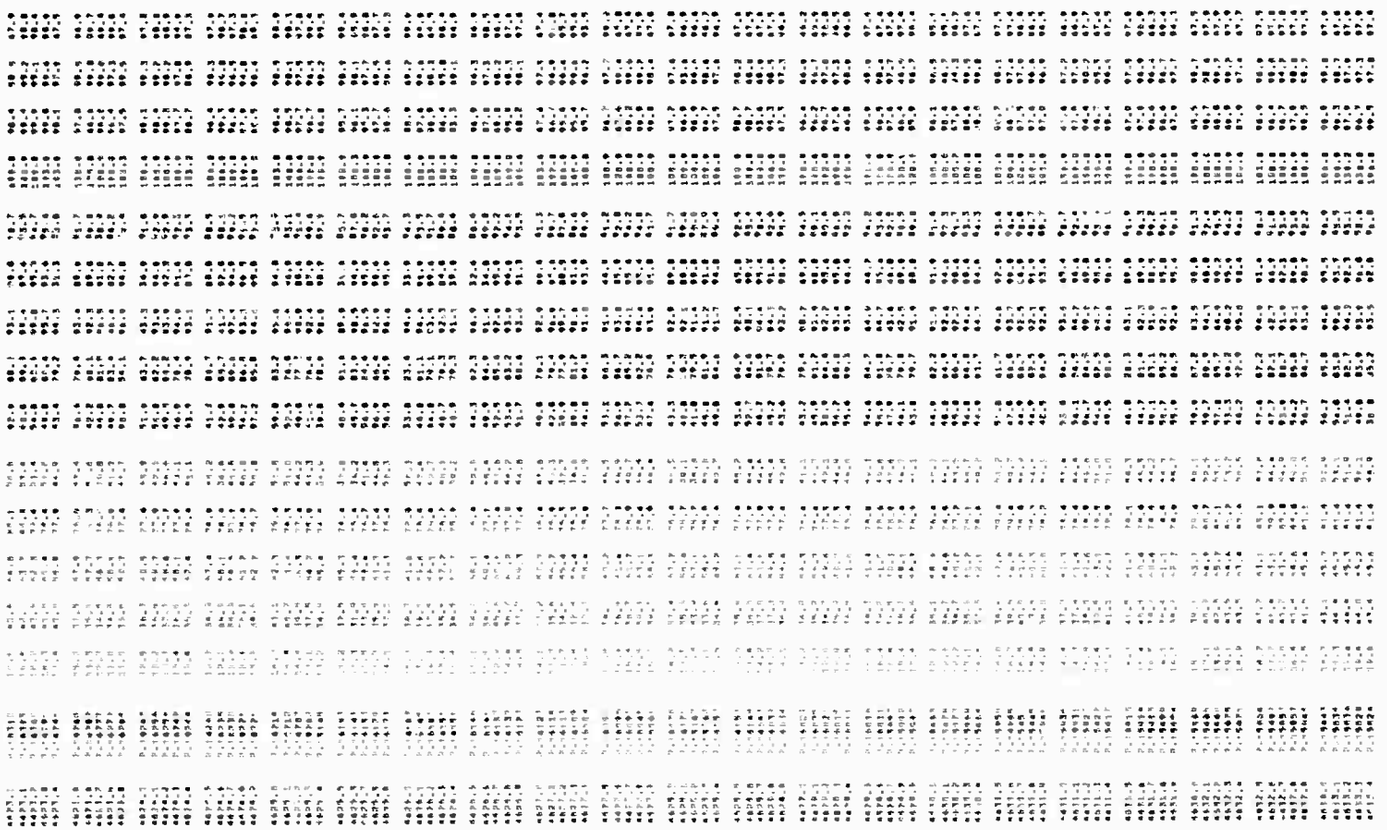


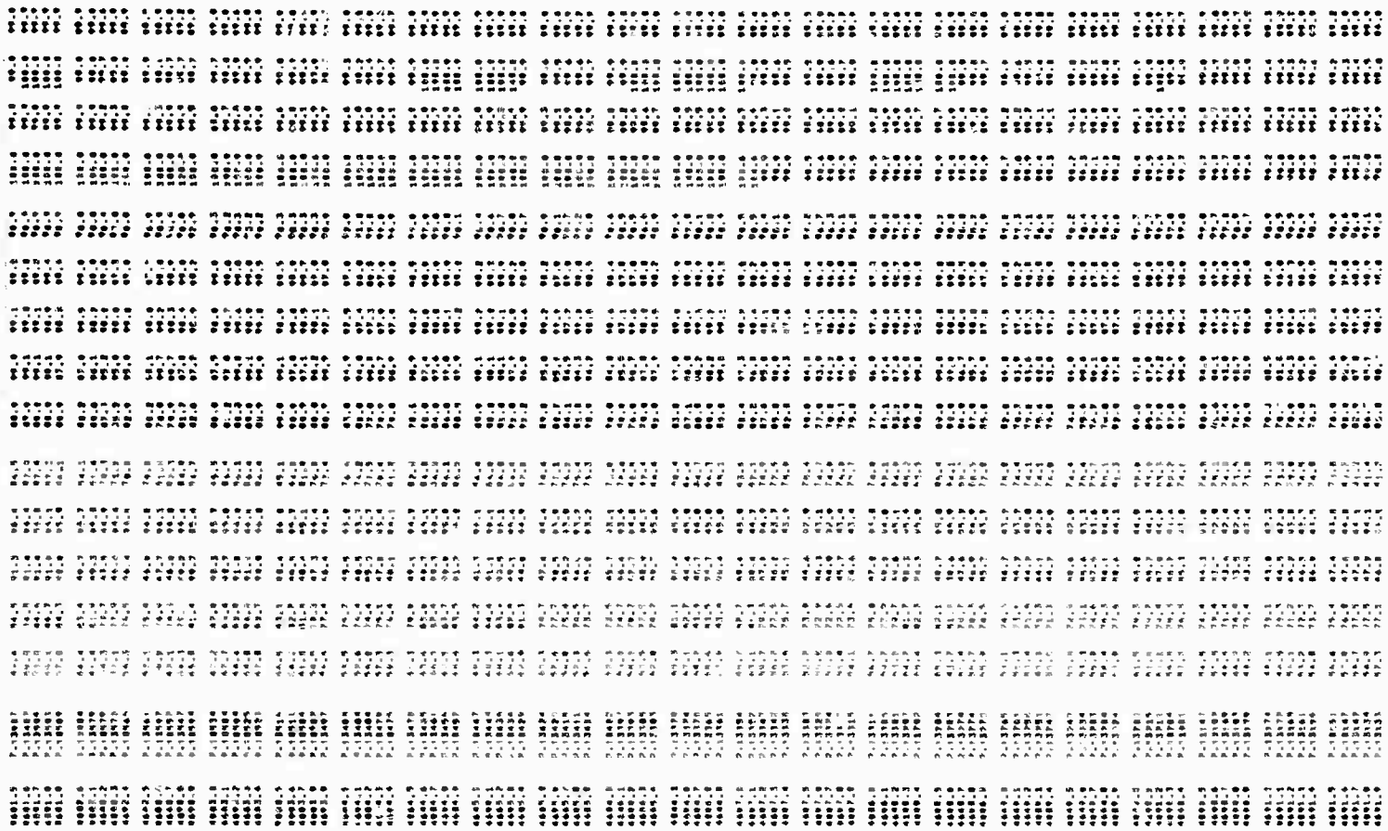
Table 6-1 (continued)

Sam. No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n
p(atm)	2.50 $\times 10^0$	2.53 $\times 10^0$	2.51 $\times 10^0$	2.50 $\times 10^0$	2.00 $\times 10^0$	$\cdots^0$ $\times$	1.000 $\times 10^0$	1.16 $\times 10^{-1}$	2.30 $\times 10^{-1}$	2.30 $\times 10^{-1}$	2.30 $\times 10^{-1}$	5.67 $\times 10^{-2}$	7.70 $\times 10^{-2}$	7.70 $\times 10^{-2}$	7.70 $\times 10^{-2}$
ϕ_a(atm)	1.29 $\times 10^0$	1.32 $\times 10^0$	3.32 $\times 10^0$	3.26 $\times 10^0$	2.62 $\times 10^0$	1.31 $\times 10^0$	1.31 $\times 10^0$	1.30 $\times 10^{-1}$	1.00 $\times 10^{-1}$	9.99 $\times 10^{-1}$	5.63 $\times 10^{-2}$	1.001 $\times 10^{-1}$	1.03 $\times 10^{-1}$	1.001 $\times 10^{-1}$
u(atm cm) STP	2.17 $\times 10^3$	1.16 $\times 10^3$	5.57 $\times 10^4$	2.61 $\times 10^4$	8.71 $\times 10^4$	9.42 $\times 10^4$	2.19 $\times 10^4$	9.94 $\times 10^3$	9.95 $\times 10^3$	9.95 $\times 10^3$	8.32 $\times 10^3$	3.32 $\times 10^3$	3.32 $\times 10^3$	3.32 $\times 10^3$

ν (cm^{-1})	λ (Wellenzahl)	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100
4613.1	2.14815	8.5	18.6	43.8	46.9	47.8	38.0	72.0	59.4	60.5	89.1	100.0	96.4	98.1	99.4
4615.1	2.14805	8.1	19.4	43.4	46.8	47.6	38.7	72.6	60.1	60.8	89.4	100.0	96.4	98.1	99.4
4617.2	2.14796	8.1	19.4	43.4	46.9	47.4	38.8	72.7	60.1	60.8	89.1	100.0	96.4	98.1	99.5
4619.2	2.14787	8.2	19.7	43.6	46.8	48.0	39.1	72.8	60.3	60.5	89.4	100.0	96.4	98.1	99.6
4621.2	2.14778	8.3	19.8	43.5	46.8	48.1	39.4	73.1	60.5	60.8	89.6	100.0	96.4	98.2	99.6
4623.3	2.14769	8.5	20.1	44.1	46.8	48.5	39.6	73.3	60.8	60.8	89.3	100.0	96.5	98.2	99.6
4625.3	2.14760	8.5	20.5	44.7	46.8	48.7	39.8	73.8	60.8	60.9	89.4	100.0	96.5	98.2	99.6
4627.4	2.14751	8.5	20.6	44.8	46.8	48.7	39.8	73.7	60.9	60.8	89.3	100.0	96.5	98.2	99.6
4629.4	2.14742	8.5	20.6	45.0	46.7	48.6	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4631.5	2.14733	8.5	20.7	45.2	46.7	48.6	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4633.6	2.14724	8.5	20.7	44.9	46.8	48.5	39.7	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4635.6	2.14715	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4637.7	2.14706	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4639.8	2.14697	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4641.8	2.14688	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4643.9	2.14679	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4645.9	2.14670	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4648.0	2.14661	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4650.0	2.14652	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4652.1	2.14643	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4654.1	2.14634	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4656.2	2.14625	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4658.2	2.14616	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4660.3	2.14607	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4662.3	2.14598	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4664.4	2.14589	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4666.4	2.14580	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4668.5	2.14571	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4670.5	2.14562	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4672.6	2.14553	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4674.6	2.14544	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4676.7	2.14535	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4678.7	2.14526	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4680.8	2.14517	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4682.8	2.14508	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4684.9	2.14499	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4686.9	2.14490	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4689.0	2.14481	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4691.0	2.14472	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4693.1	2.14463	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4695.1	2.14454	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4697.2	2.14445	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4699.2	2.14436	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4701.3	2.14427	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6
4703.3	2.14418	8.5	20.7	45.1	46.8	48.7	39.8	73.7	60.9	60.8	89.6	100.0	96.4	98.2	99.6

Sam. No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n
p(atm)	2.50 $\times 10^0$	2.53 $\times 10^0$	2.51 $\times 10^0$	2.50 $\times 10^0$	2.00 $\times 10^0$	1.000 $\times 10^0$	1.000 $\times 10^0$	1.16 $\times 10^{-1}$	2.30 $\times 10^{-1}$	2.30 $\times 10^{-1}$	2.67 $\times 10^{-2}$	7.70 $\times 10^{-2}$	7.70 $\times 10^{-2}$	7.70 $\times 10^{-2}$
ϕ_a(atm)	3.29 $\times 10^0$	3.32 $\times 10^0$	3.32 $\times 10^0$	3.29 $\times 10^0$	2.67 $\times 10^0$	1.30 $\times 10^0$	1.31 $\times 10^0$	1.30 $\times 10^{-1}$	9.99 $\times 10^{-1}$	9.96 $\times 10^{-1}$	5.63 $\times 10^{-2}$	1.001 $\times 10^{-1}$	1.03 $\times 10^{-1}$	1.001 $\times 10^{-1}$
u(atm cm) BSP	2.11 $\times 10^3$	1.11 $\times 10^3$	5.57 $\times 10^4$	2.91 $\times 10^4$	8.71 $\times 10^4$	8.87 $\times 10^4$	2.08 $\times 10^4$	9.94 $\times 10^3$	9.95 $\times 10^3$	9.95 $\times 10^3$	8.32 $\times 10^3$	3.32 $\times 10^3$	3.32 $\times 10^3$	3.32 $\times 10^3$

ν (cm^{-1})	λ (Wellenzahl)	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100	T = 100
4672.9	2.14168	77.7	84.7	91.5	94.3	94.8	88.8	97.2	98.7	98.2	98.8	100.0	100.0	100.0	100.0
4672.6	2.14154	74.8	83.8	91.4	94.1	94.6	88.8	97.0	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4674.7	2.14144	74.8	83.8	91.6	94.0	94.7	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4676.8	2.14134	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4678.8	2.14124	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4680.9	2.14114	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4683.0	2.14105	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4685.0	2.14095	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4687.1	2.14085	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4689.1	2.14075	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4691.2	2.14065	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4693.2	2.14056	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4695.3	2.14046	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4697.3	2.14036	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4699.4	2.14026	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4701.4	2.14016	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4703.5	2.14007	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4705.5	2.13997	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4707.6	2.13987	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4709.6	2.13977	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4711.6	2.13968	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4713.7	2.13958	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4715.8	2.13948	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4717.8	2.13938	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4719.9	2.13929	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4721.9	2.13919	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4724.0	2.13909	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4726.0	2.13899	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4728.1	2.13890	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4730.1	2.13880	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4732.2	2.13870	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4734.2	2.13860	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4736.3	2.13851	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4738.3	2.13841	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4740.4	2.13831	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4742.4	2.13821	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4744.5	2.13812	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4746.5	2.13802	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4748.6	2.13792	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4750.6	2.13782	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4752.7	2.13773	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4754.7	2.13763	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4756.8	2.13753	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4758.8	2.13744	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4760.9	2.13734	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4762.9	2.13724	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4765.0	2.13715	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4767.0	2.13705	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4769.1	2.13695	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4771.1	2.13686	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4773.2	2.13676	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4775.2	2.13666	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4777.3	2.13657	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4779.3	2.13647	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4781.4	2.13637	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4783.4	2.13628	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4785.5	2.13618	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4787.5	2.13608	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4789.6	2.13599	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4791.6	2.13589	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4793.7	2.13579	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4795.7	2.13570	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4797.8	2.13560	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4799.8	2.13550	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4801.8	2.13541	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0
4803.9	2.13531	74.8	83.8	91.6	94.1	94.6	88.8	97.2	98.8	98.2	98.8	100.0	100.0	100.0	100.0



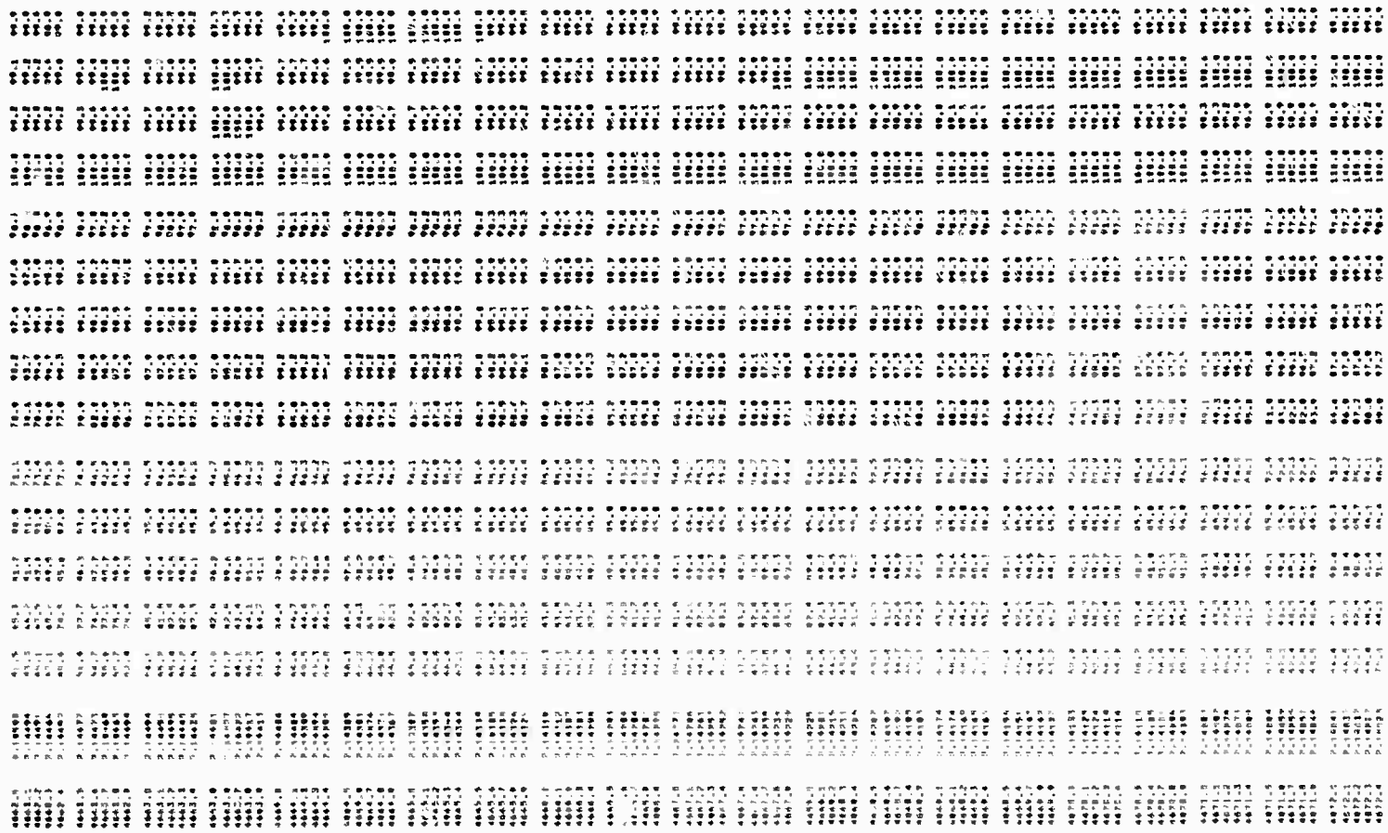


Table 6-1 (continued)

Exp. No.		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
pl (atm-cm)		[illegible]	2.53 × 10[illegible]	2.53 × 10^0	2.50 × 10^0	2.00 × 10^0	1.000 × 10^0	1.050 × 10^0	1.16 × 10^{-1}	2.30 × 10^{-1}	2.30 × 10^{-1}	1.87 × 10^{-2}	7.70 × 10^{-3}	7.70 × 10^{-2}	7.70 × 10^{-2}	1.18 × 10^{-2}	2.34 × 10^{-2}	2.34 × 10^{-2}	2.34 × 10^{-2}	9.47 × 10^{-1}
P_e (atm)		[illegible]	1.32 × 10^0	1.12 × 10^0	1.24 × 10^0	2.47 × 10^0	1.31 × 10^0	1.31 × 10^0	1.50 × 10^{-1}	3.00 × 10^{-1}	9.98 × 10^{-1}	5.03 × 10^{-2}	1.003 × 10^{-2}	3.53 × 10^{-1}	1.003 × 10^0	1.55 × 10^{-2}	5.06 × 10^{-2}	1.02 × 10^{-1}	3.40 × 10^{-1}	9.70 × 10^{-1}
N (atm-cm) STP		[illegible]	[illegible]	3.57 × 10^4	2.81 × 10^4	8.71 × 10^4	4.62 × 10^4	2.19 × 10^4	8.96 × 10^3	8.95 × 10^3	9.83 × 10^3	3.12 × 10^3	3.12 × 10^3	3.32 × 10^3	1.32 × 10^3	1.01 × 10^3	1.01 × 10^3	1.01 × 10^3	1.01 × 10^3	1.01 × 10^3
ν (cm^{-1})	λ (micron)	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100

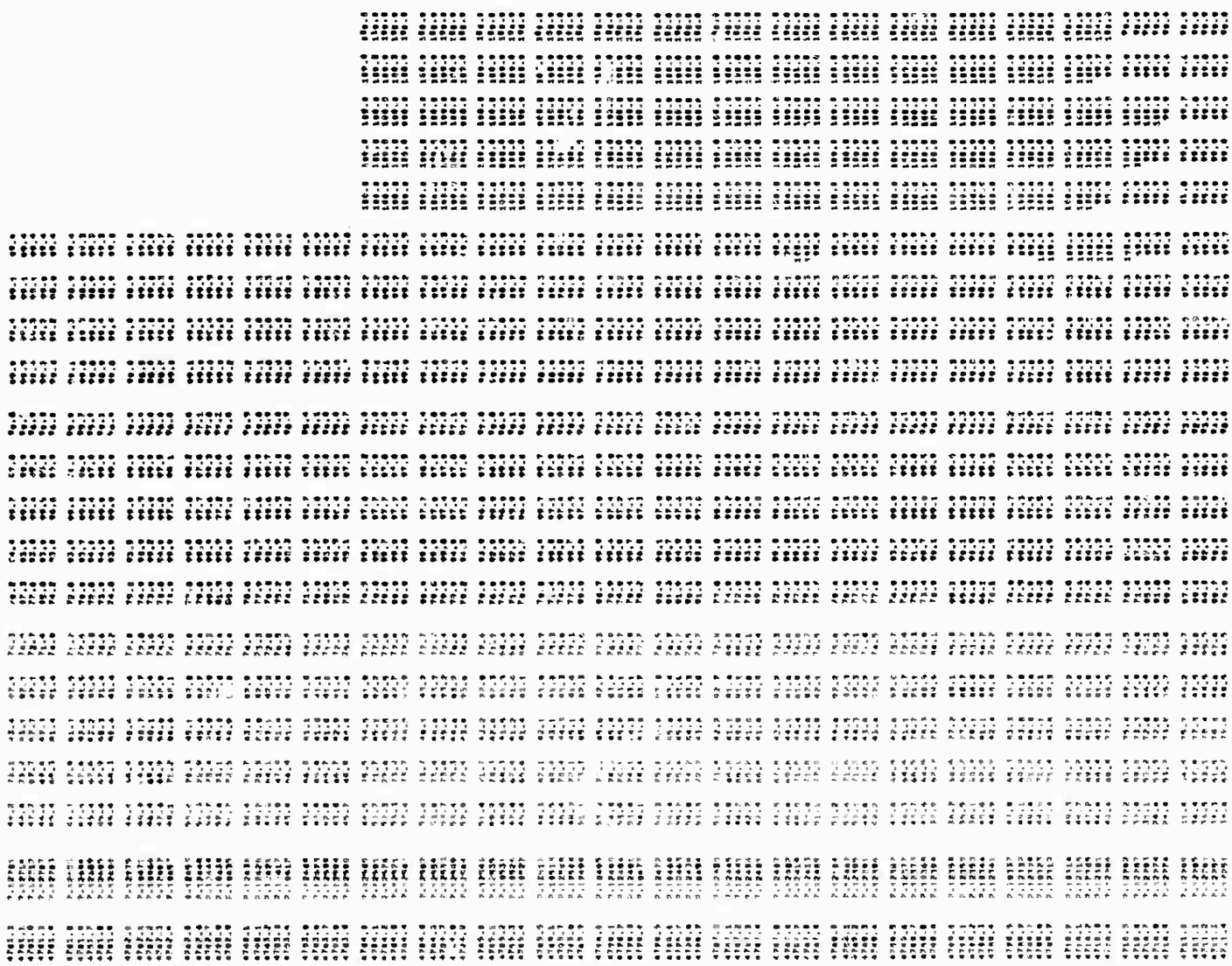
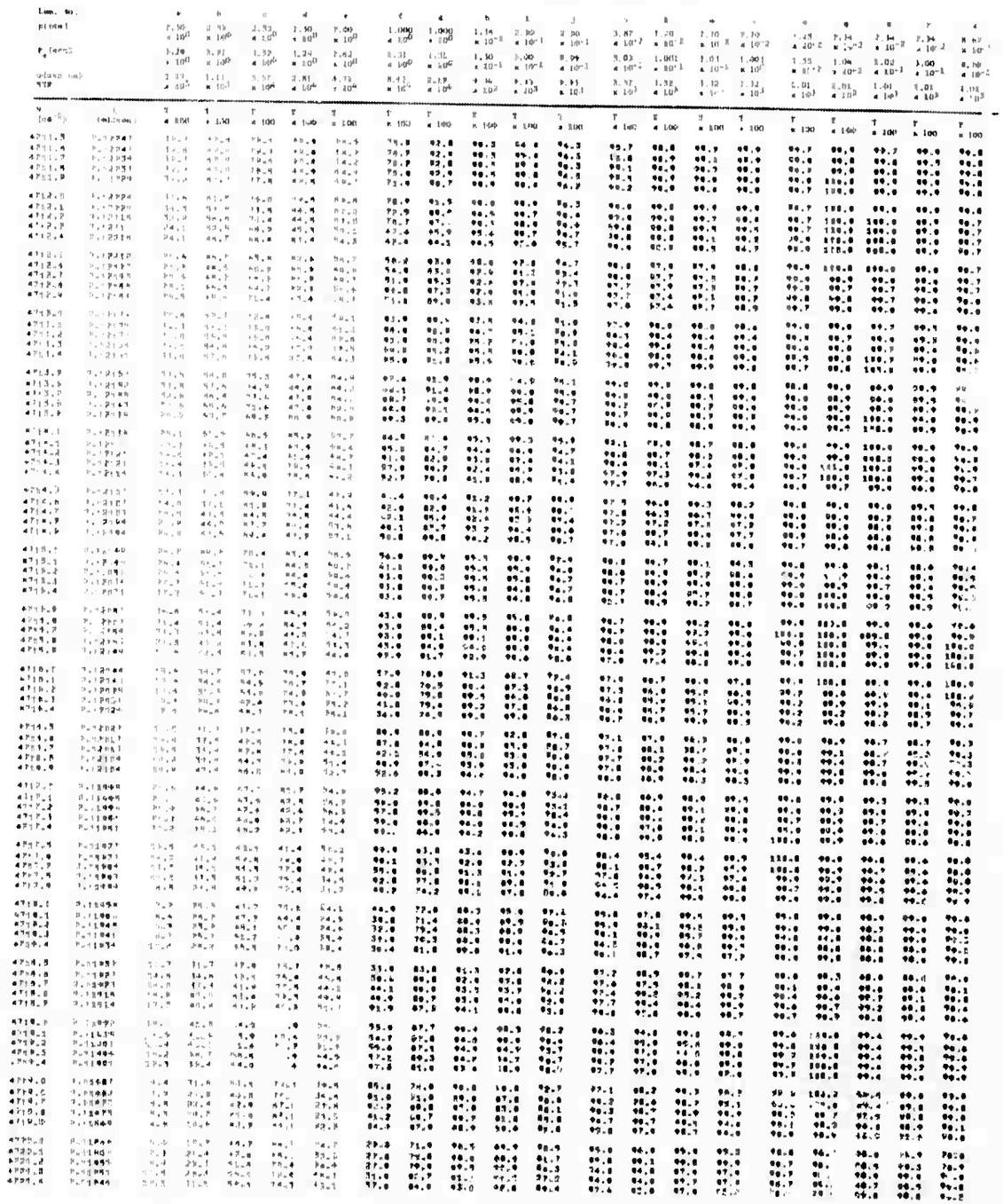


Table 6-1 (continued)



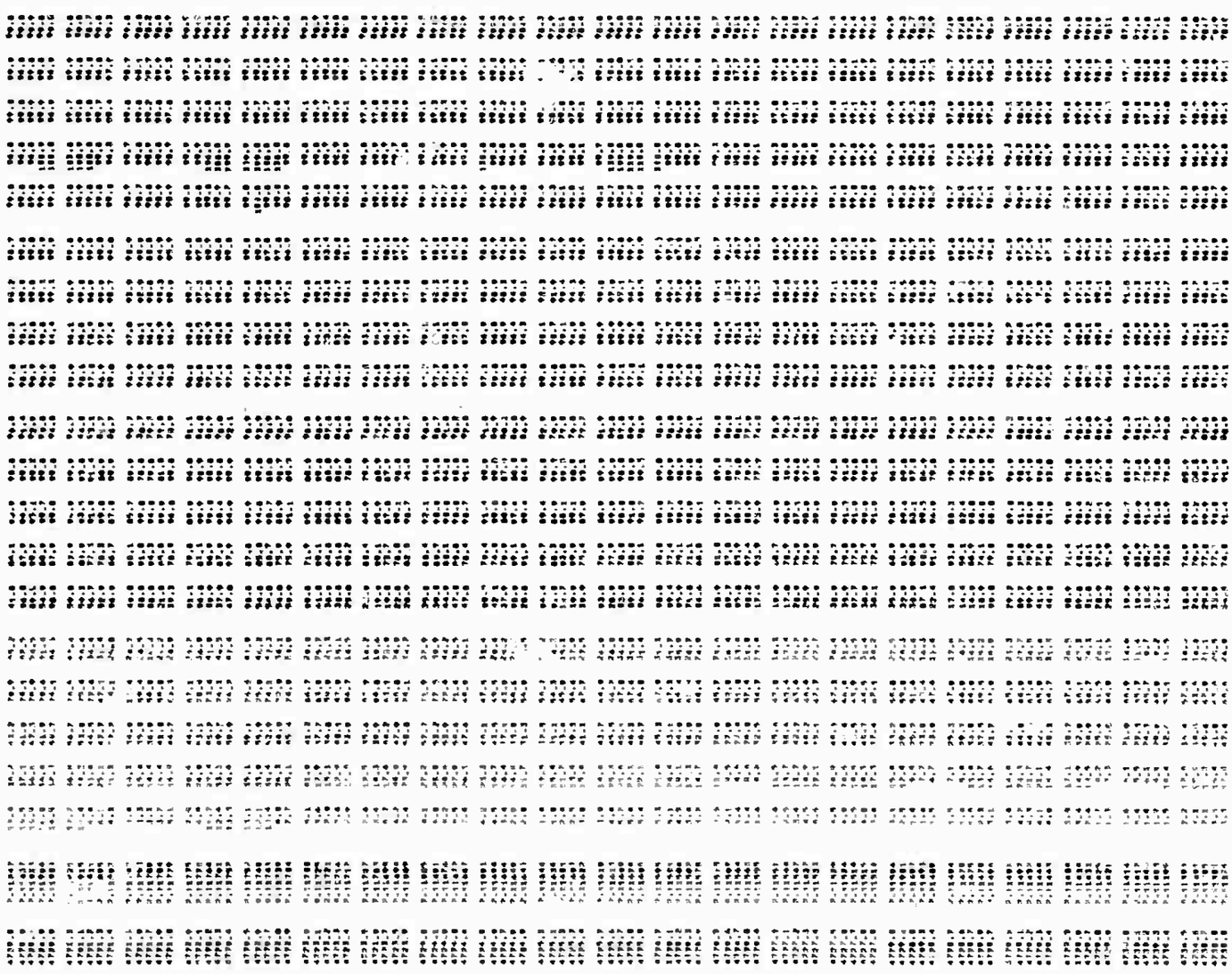


Table 6-1 (continued)

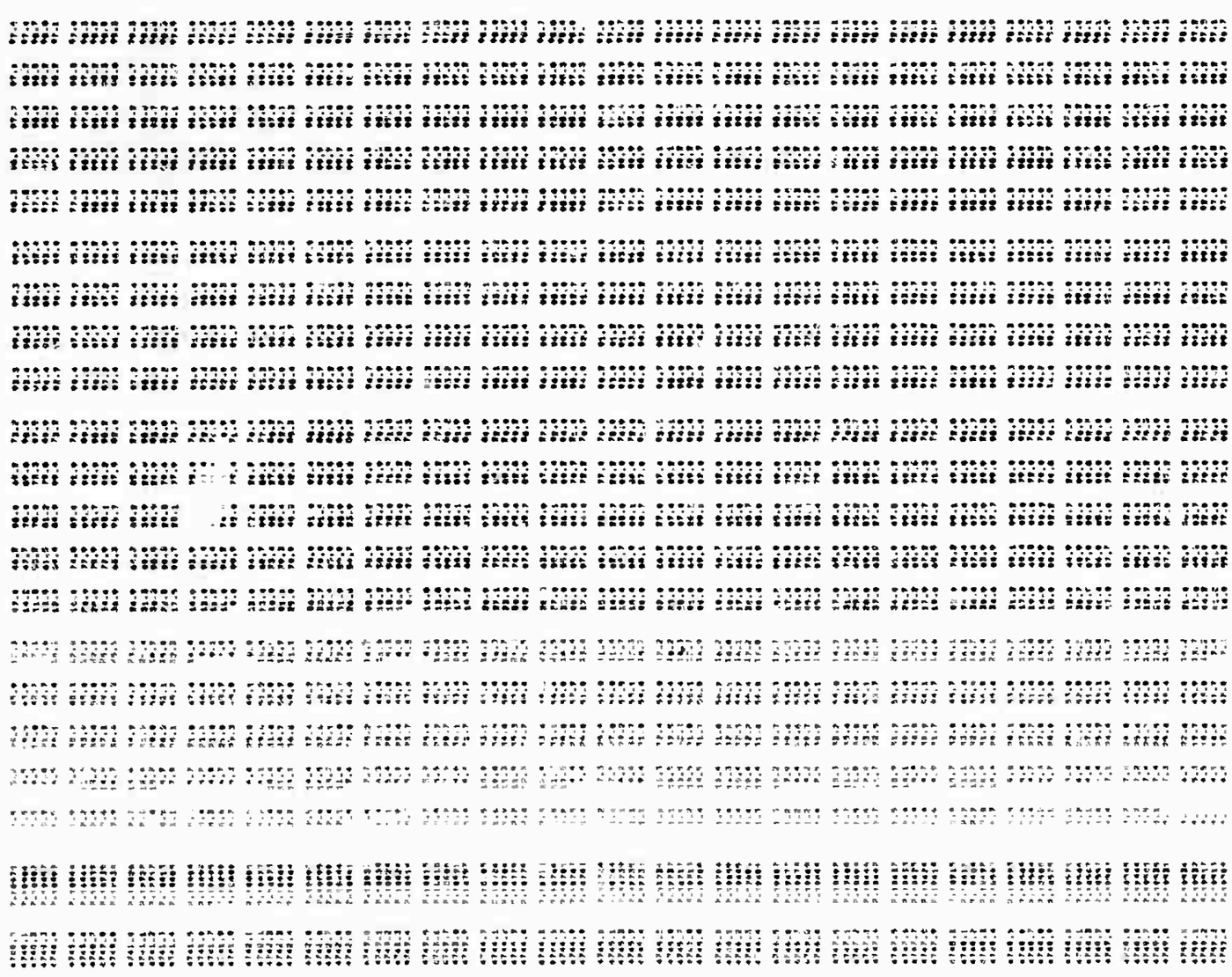


Table 6-1 (continued)

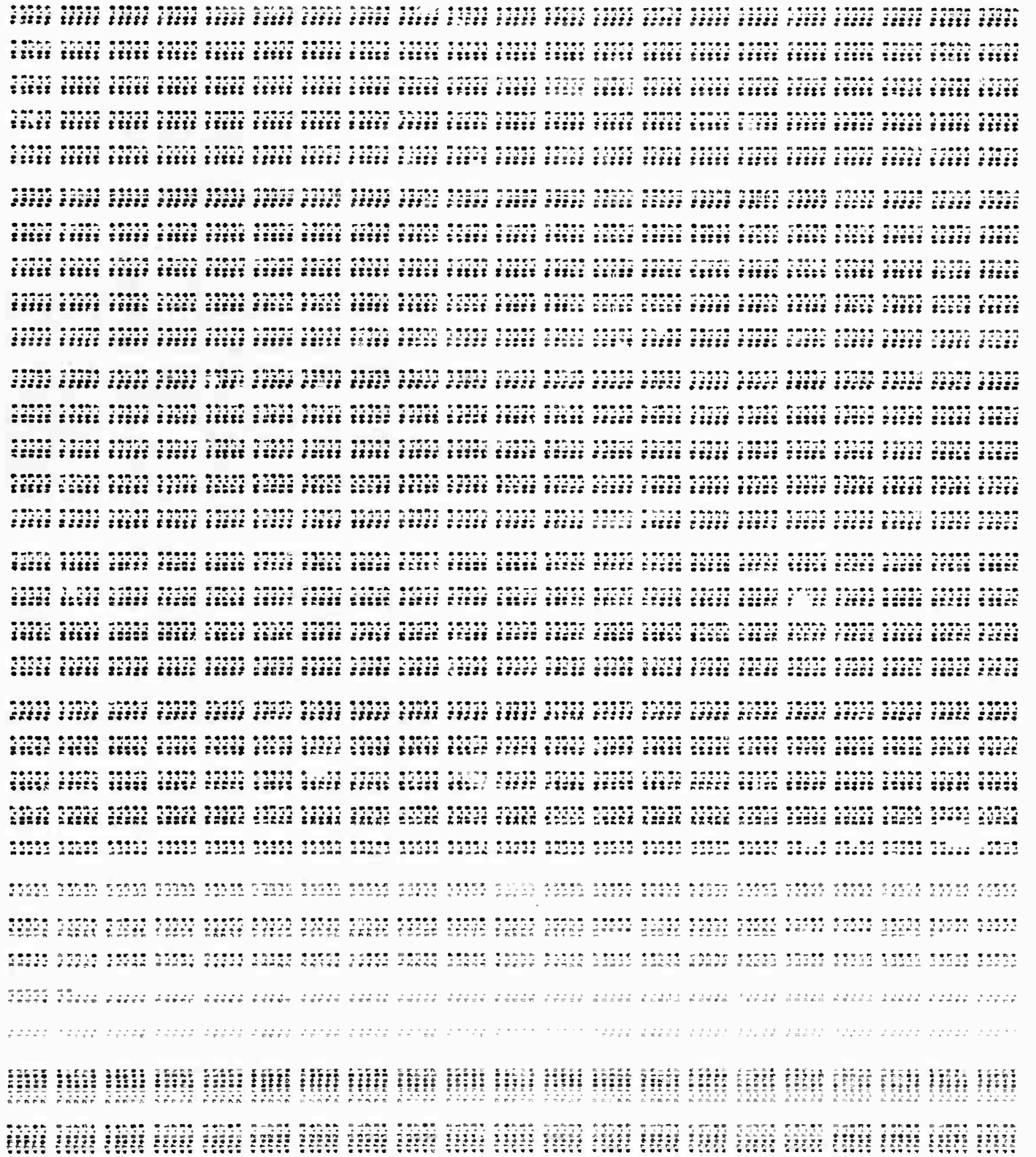


Table 6-1 (continued)

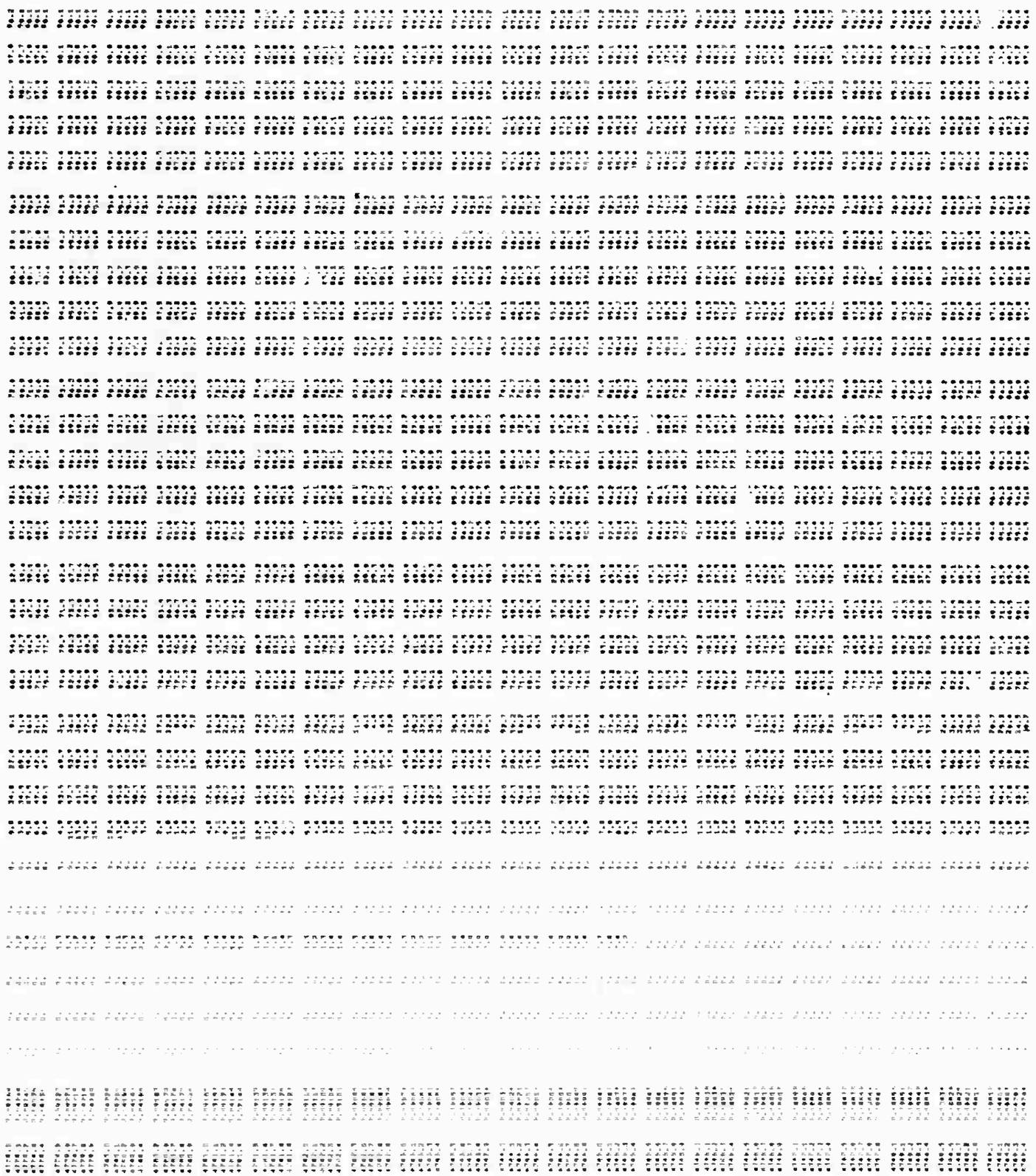


Table 6-1 (continued)

Table 6-1 (continued)

Table 6-1 (continued)

Table 6-1 (continued)

Table 6-1 (continued)

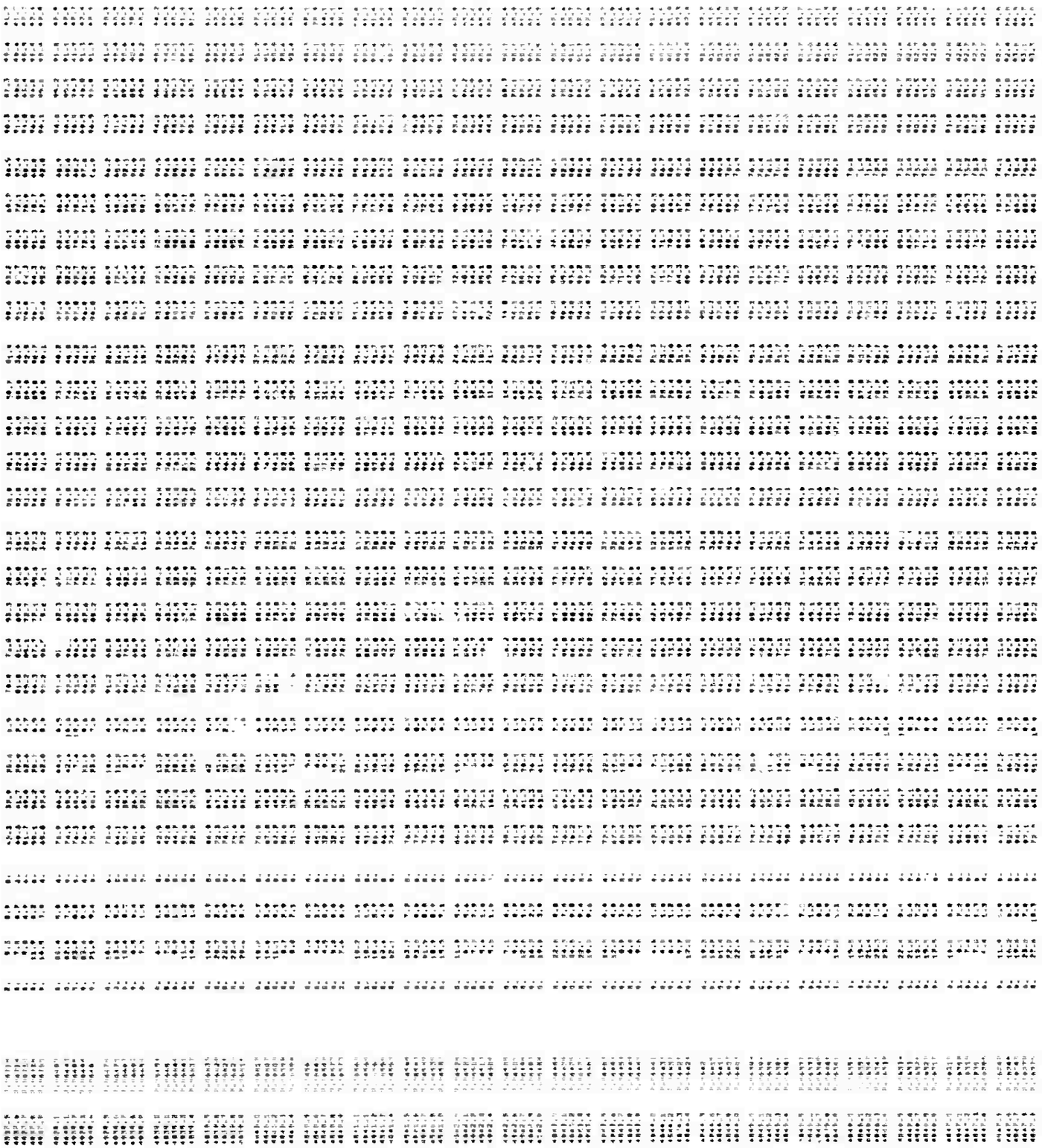


Table 6-1 (continued)

Table 6-1 (continued)

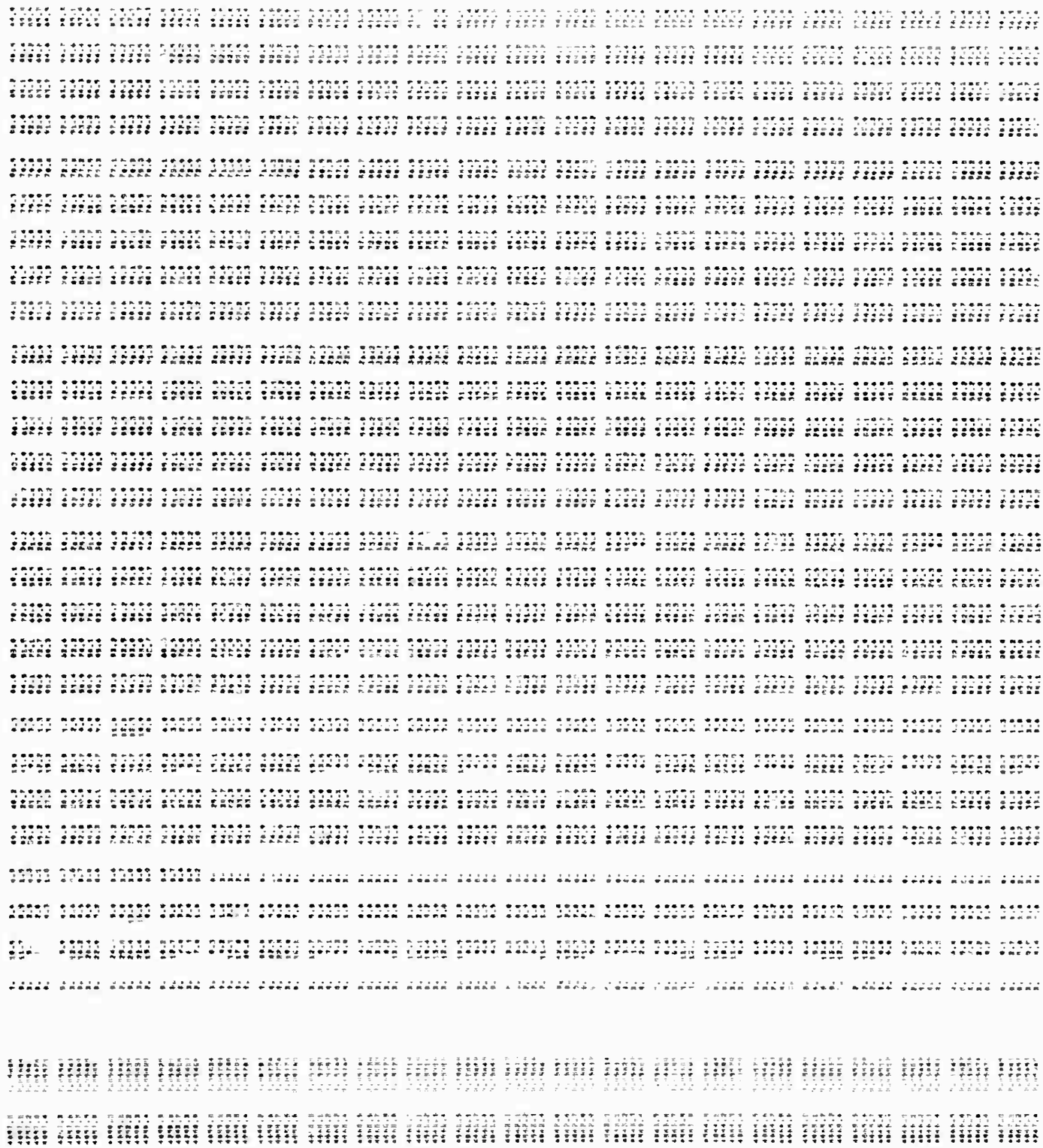
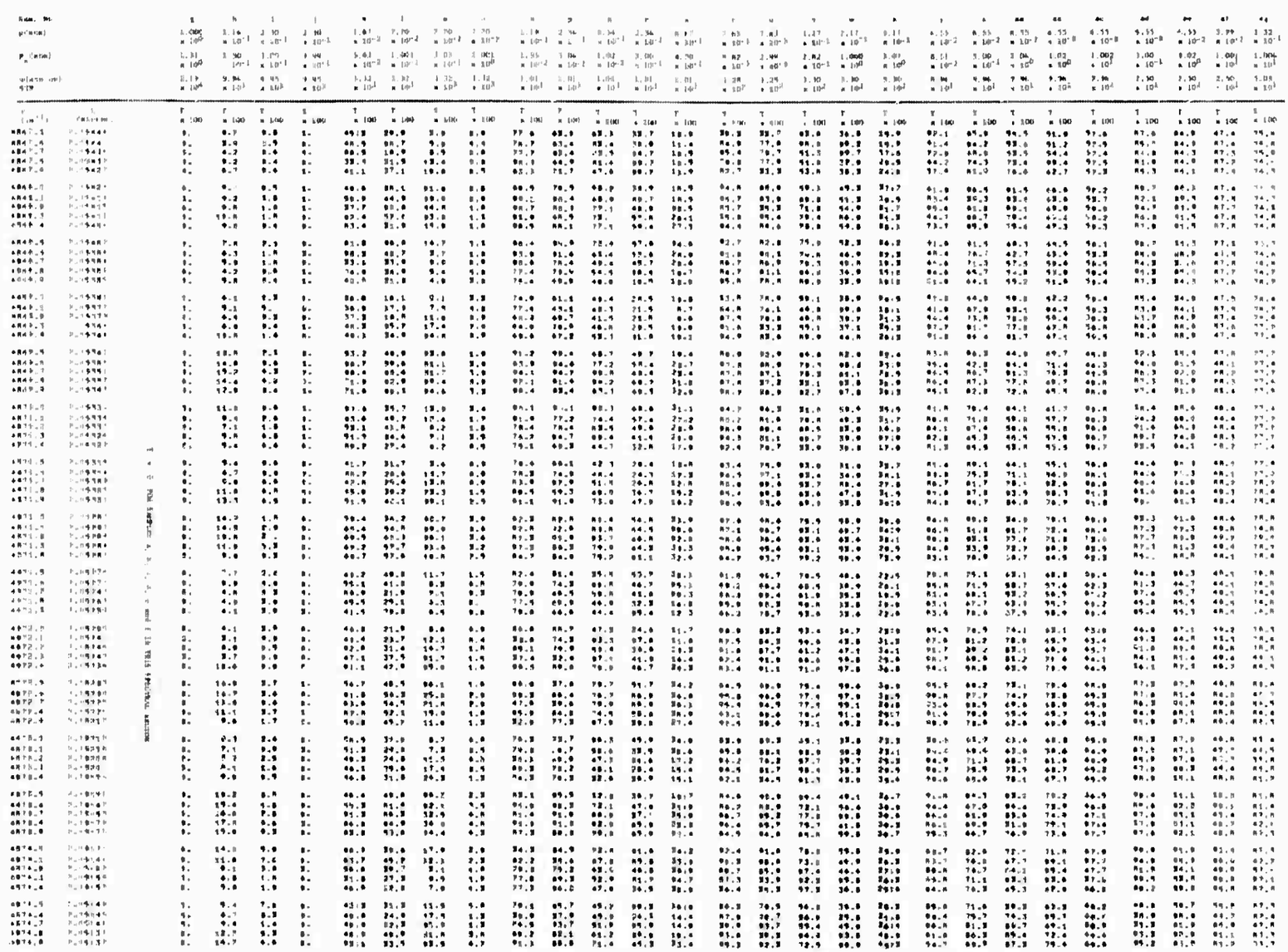


Table 6-1 (continued)



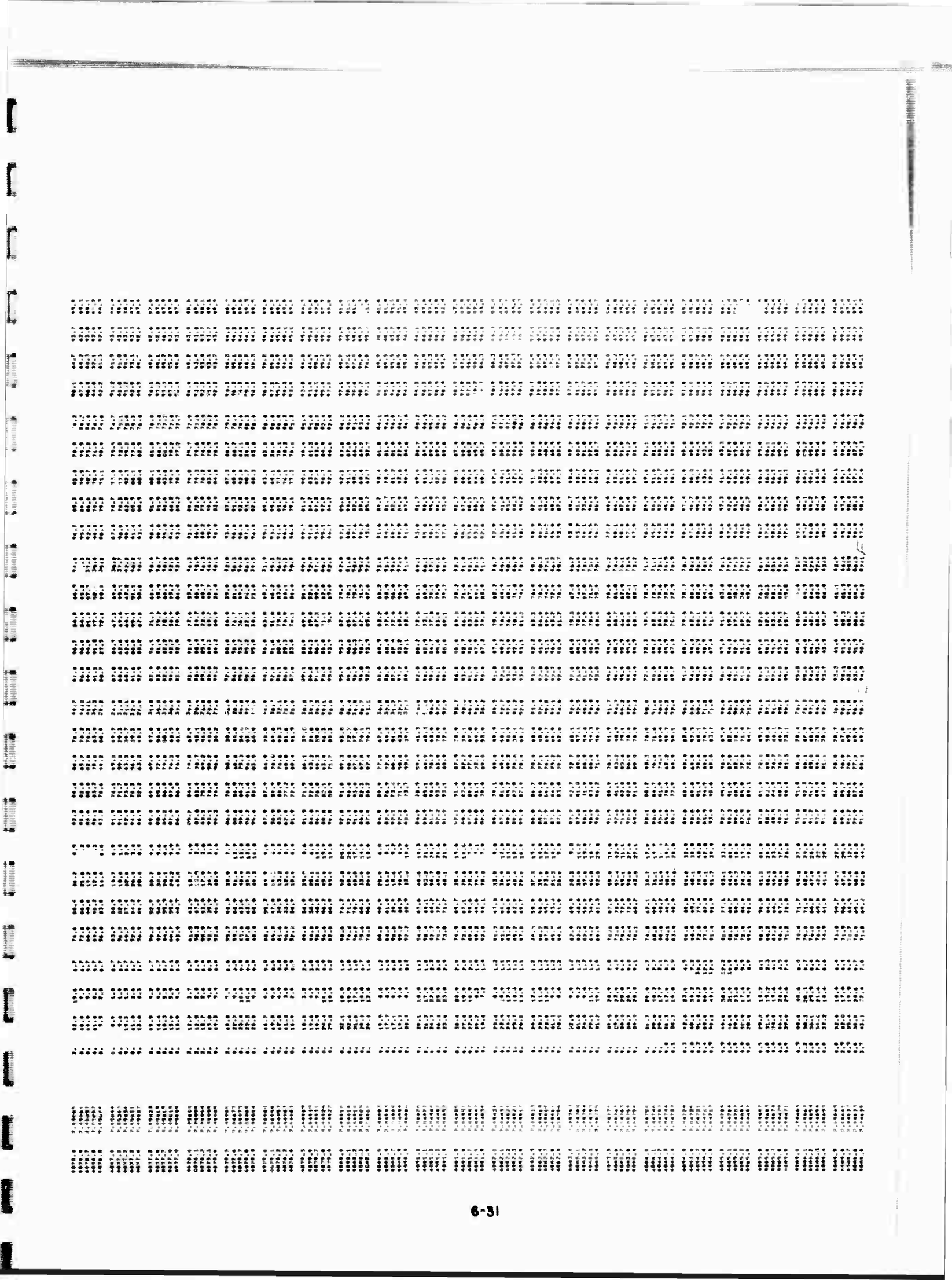


Table 6-1 (continued)

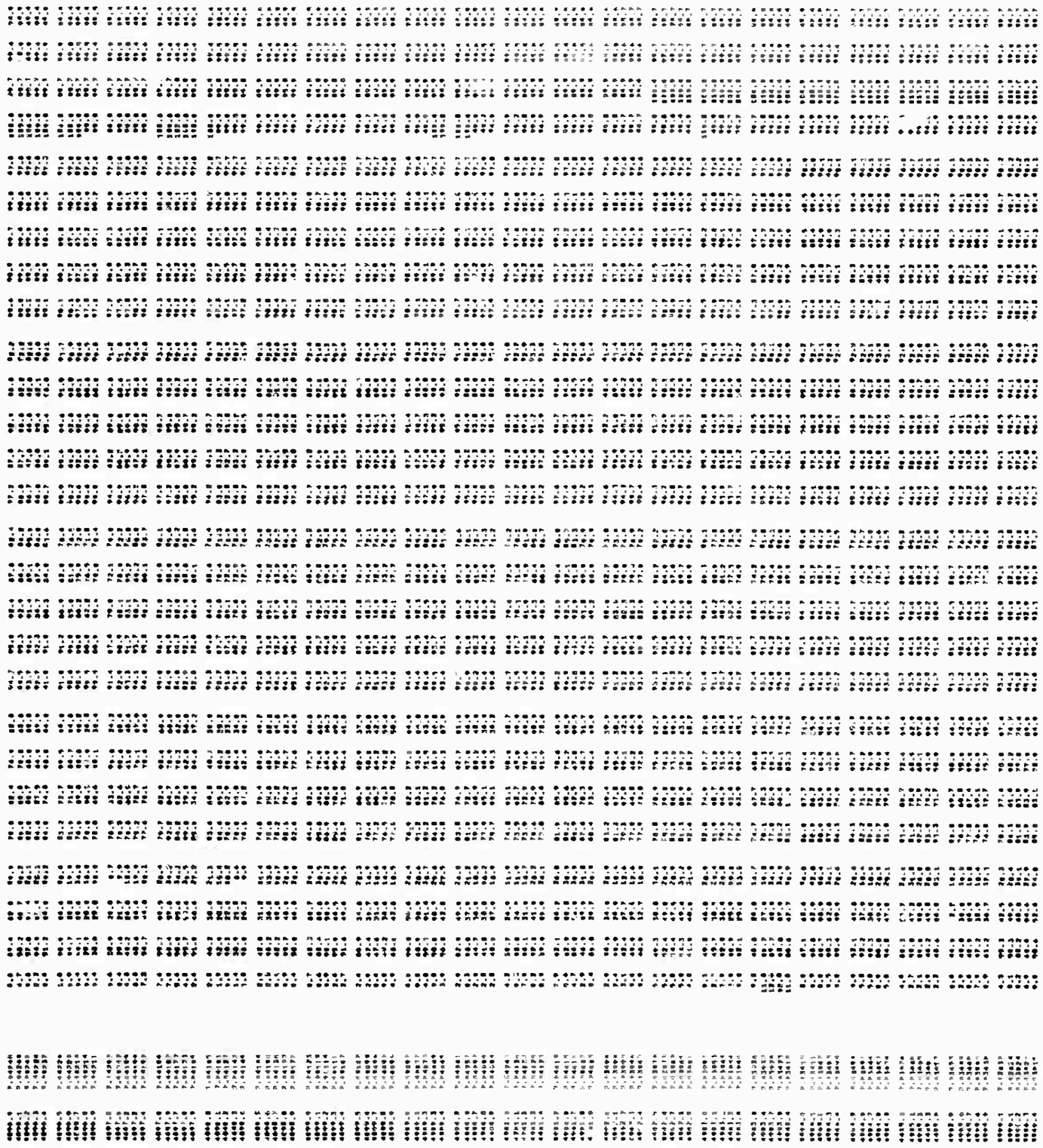


Table 6-1 (continued)

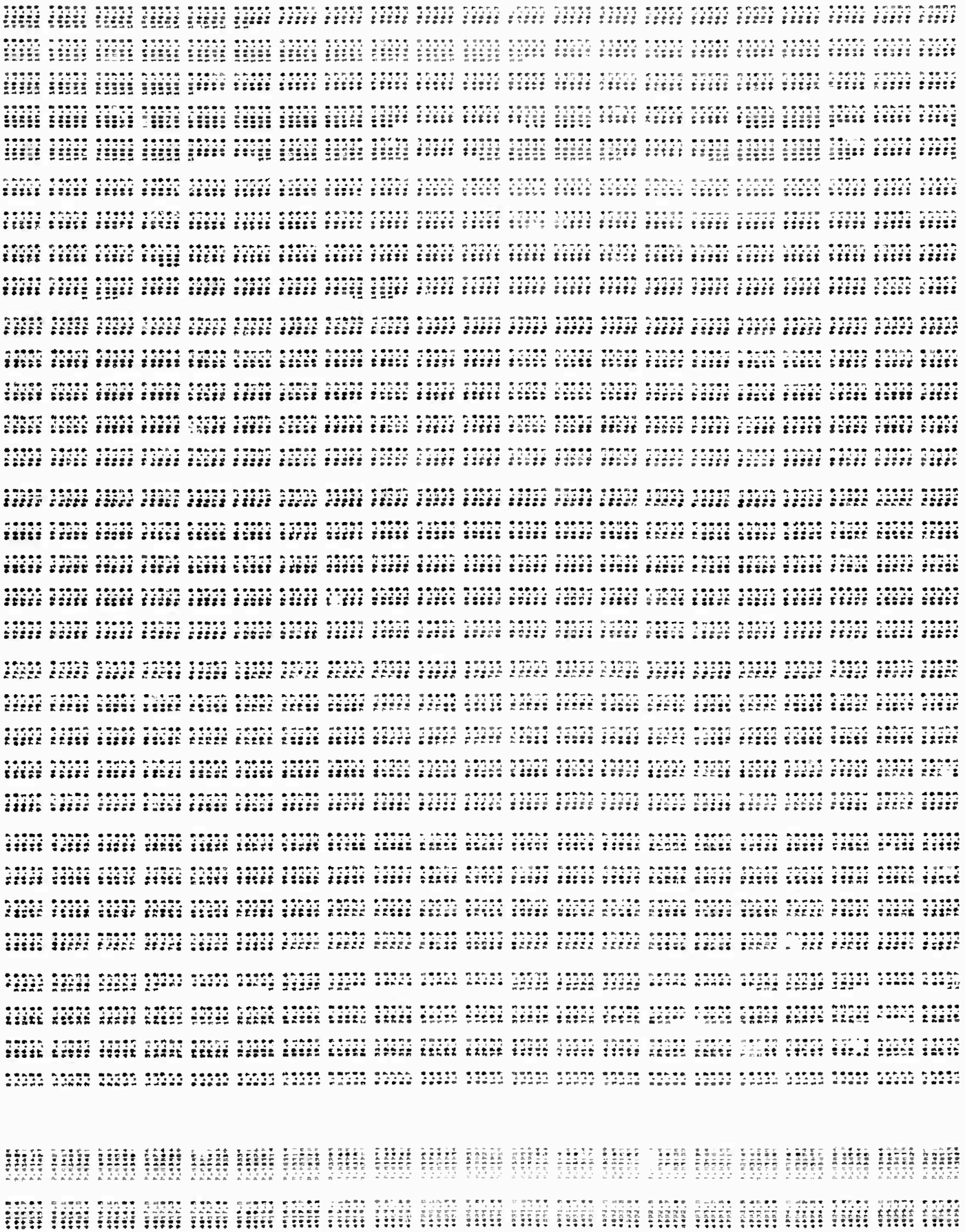


Table 6-1 (continued)

Table 6-1 (continued)

Table 6-1 (continued)

Table 6-1 (continued)

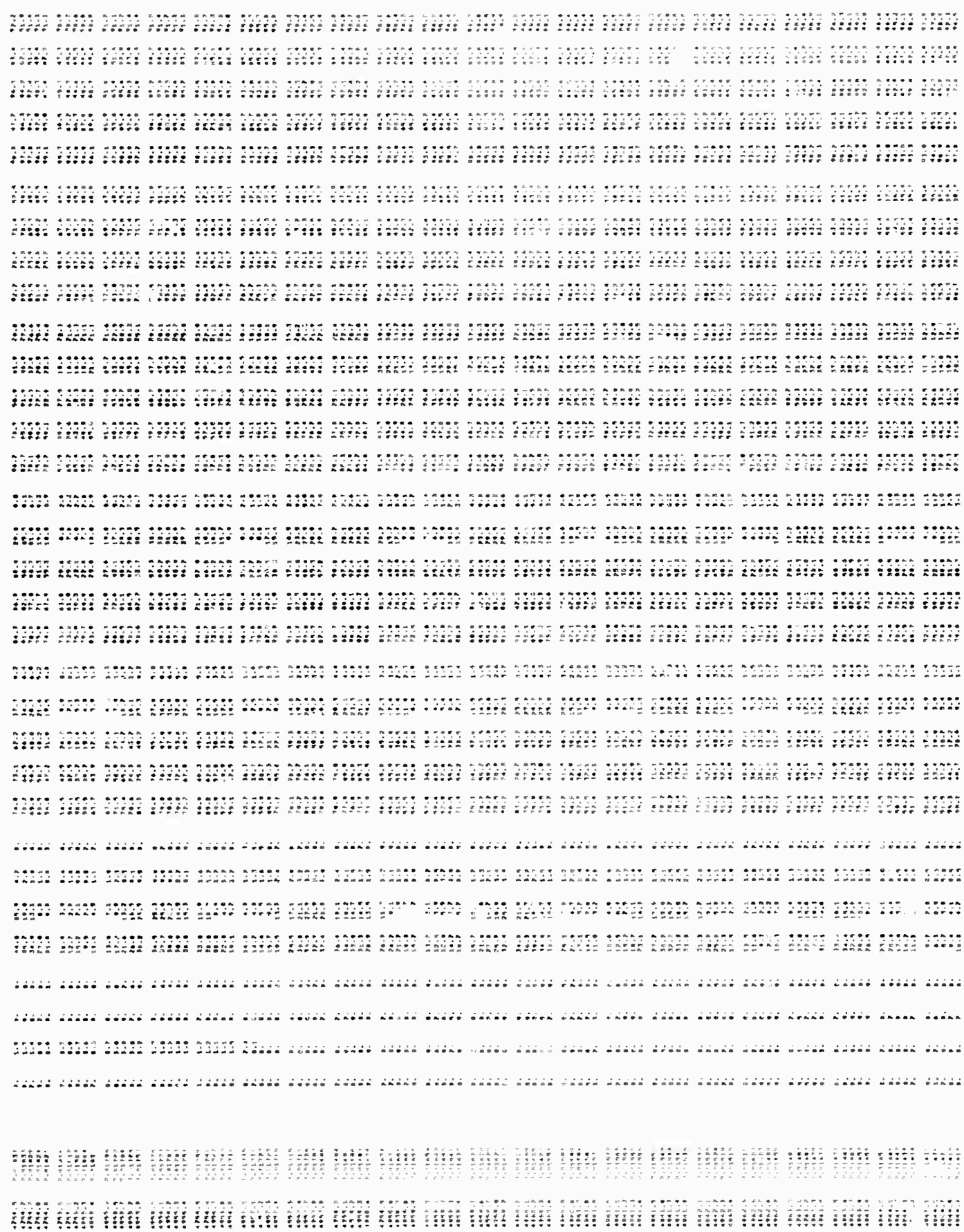
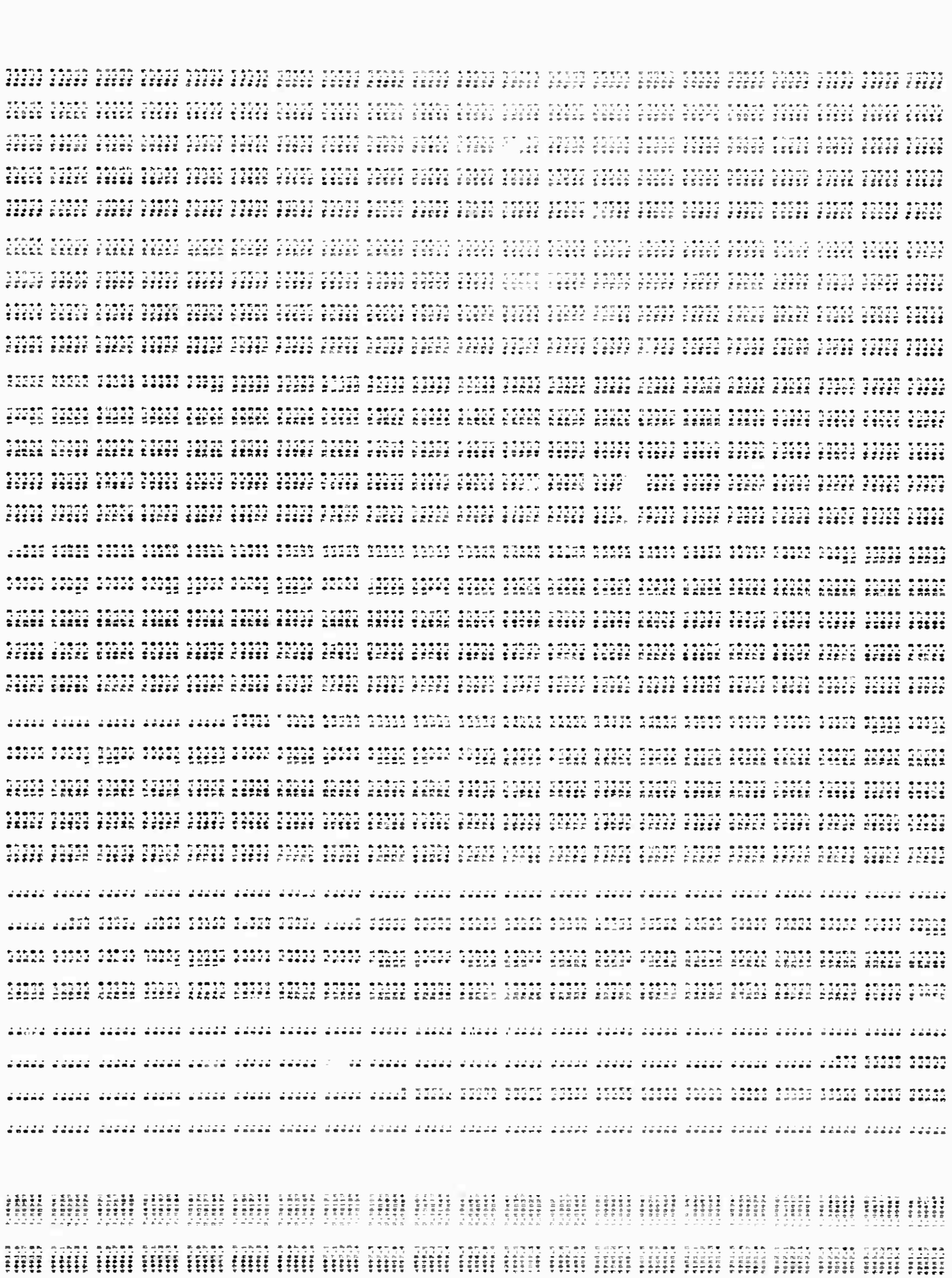


Table 6-1 (continued)

Table 6-1 (continued)



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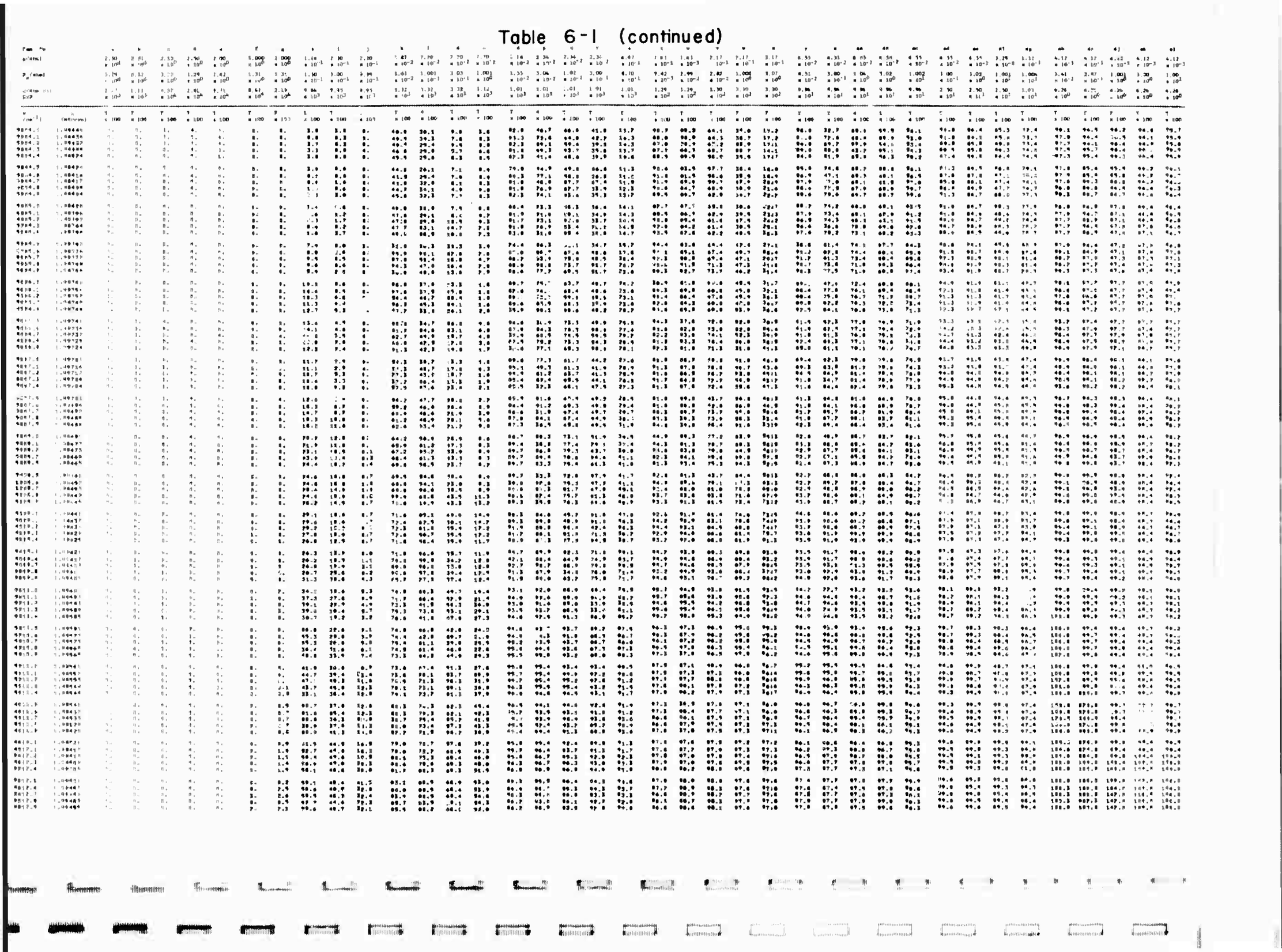
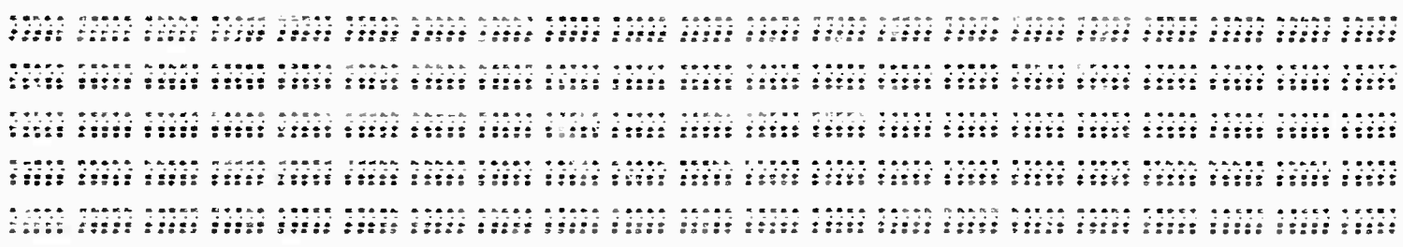
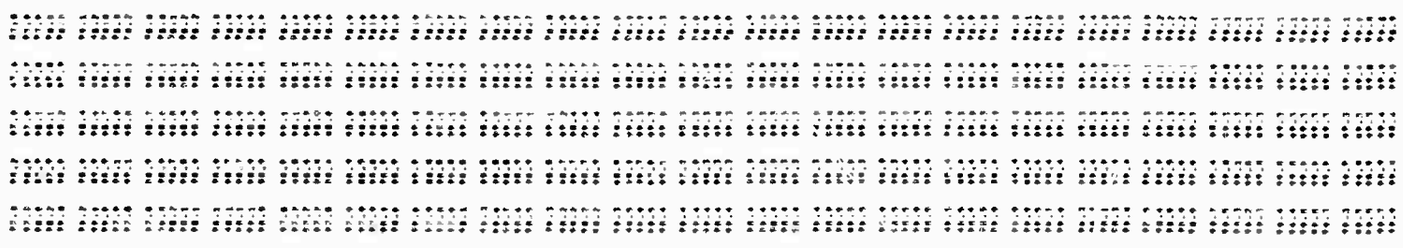
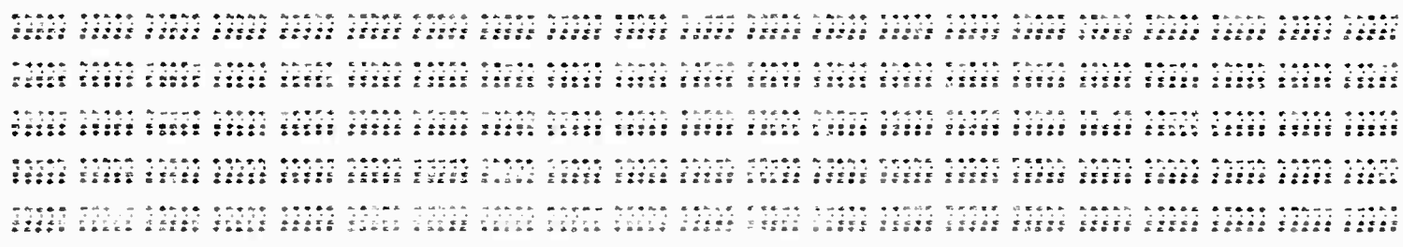
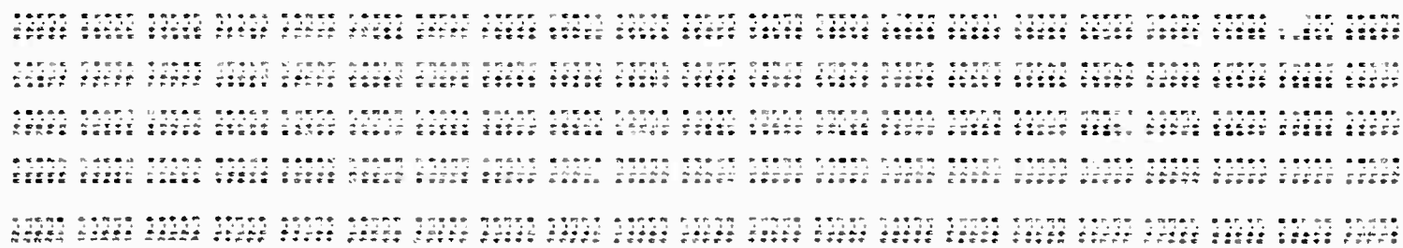
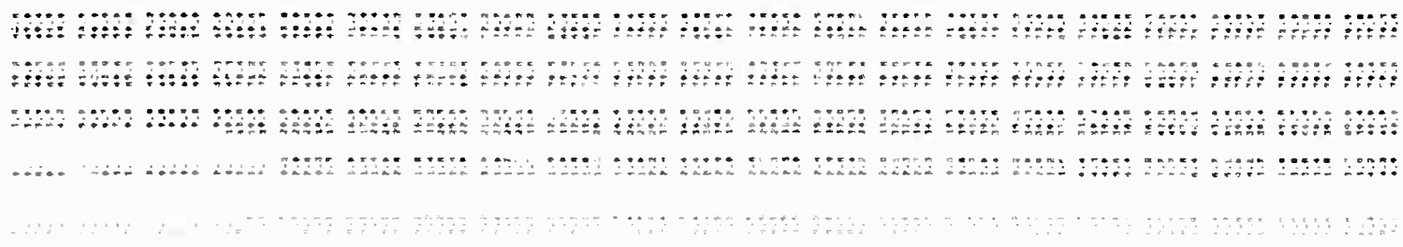












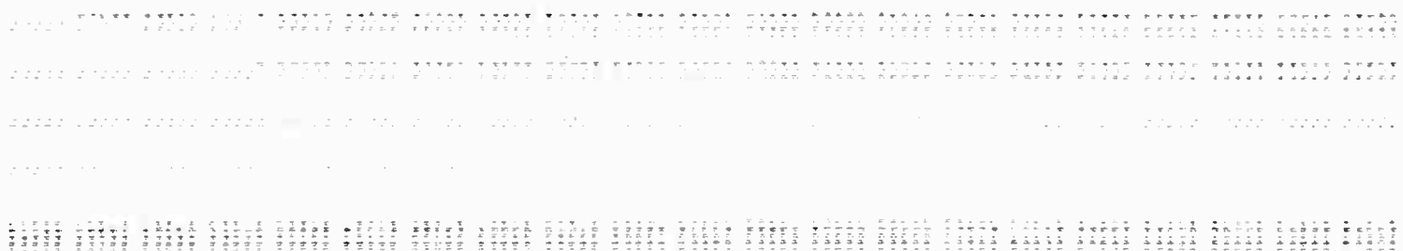


Table 6-1 (continued)

Table 6-1 (continued)

Table 6-3 (continued)

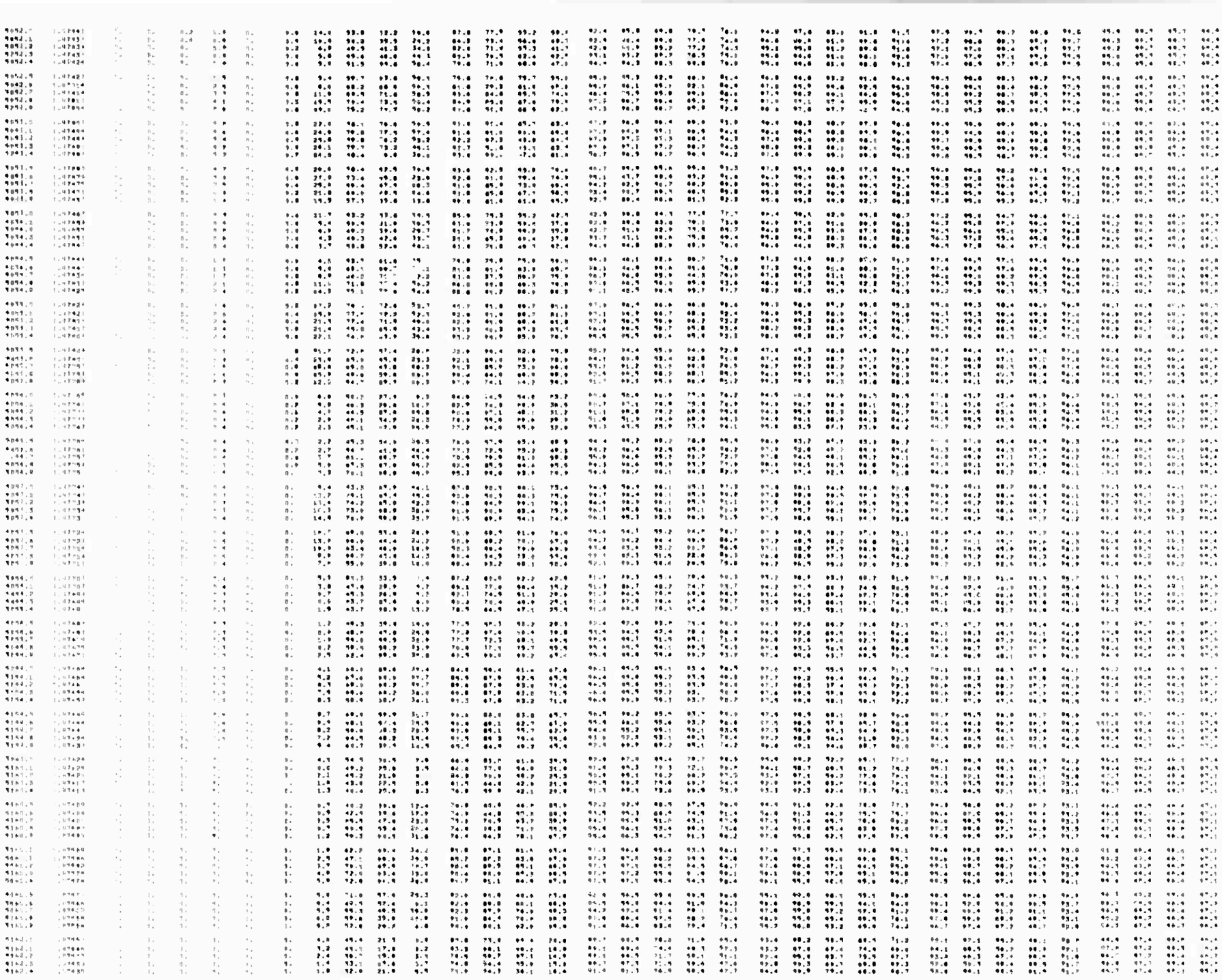
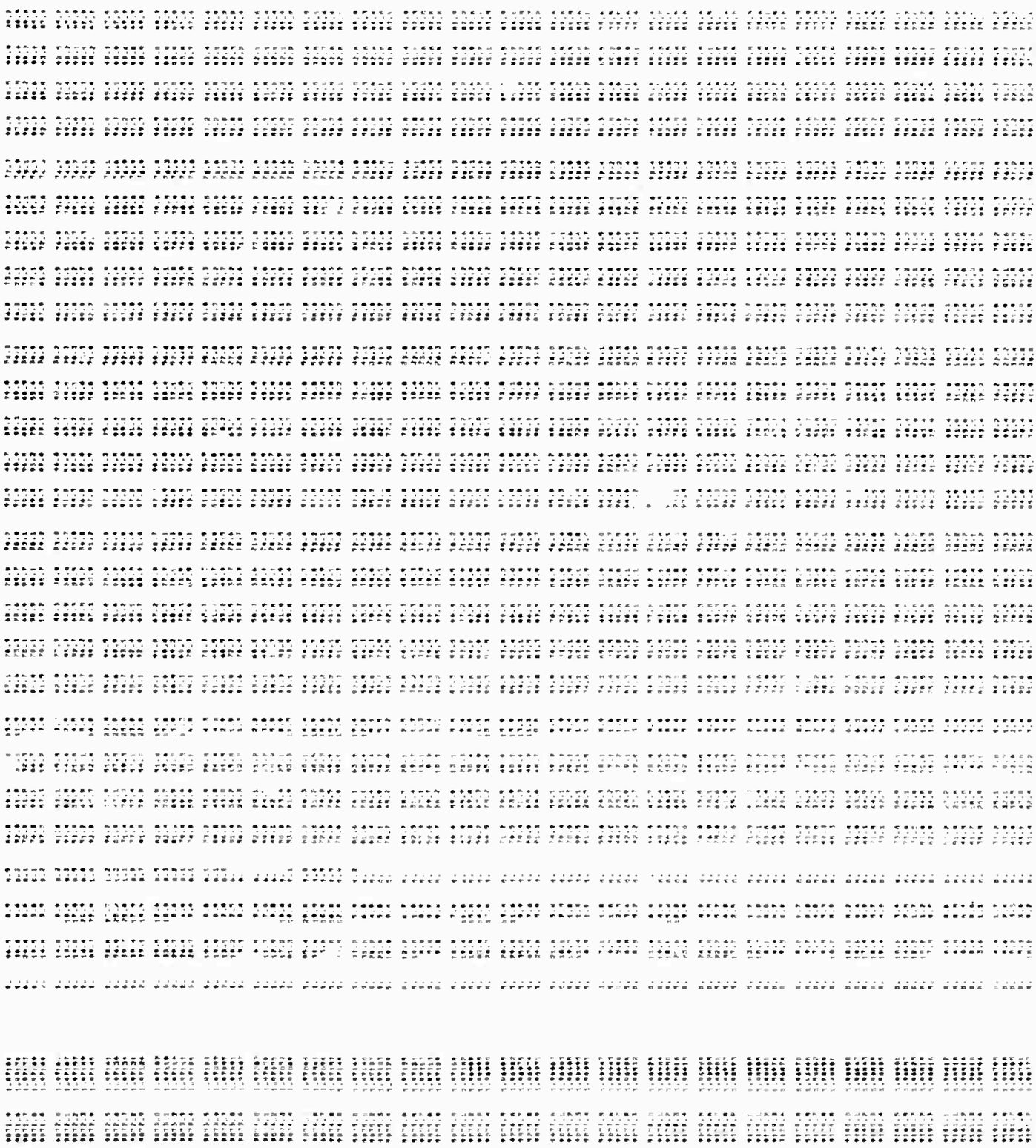


Table 6-1 (continued)

Table 6-1 (continued)



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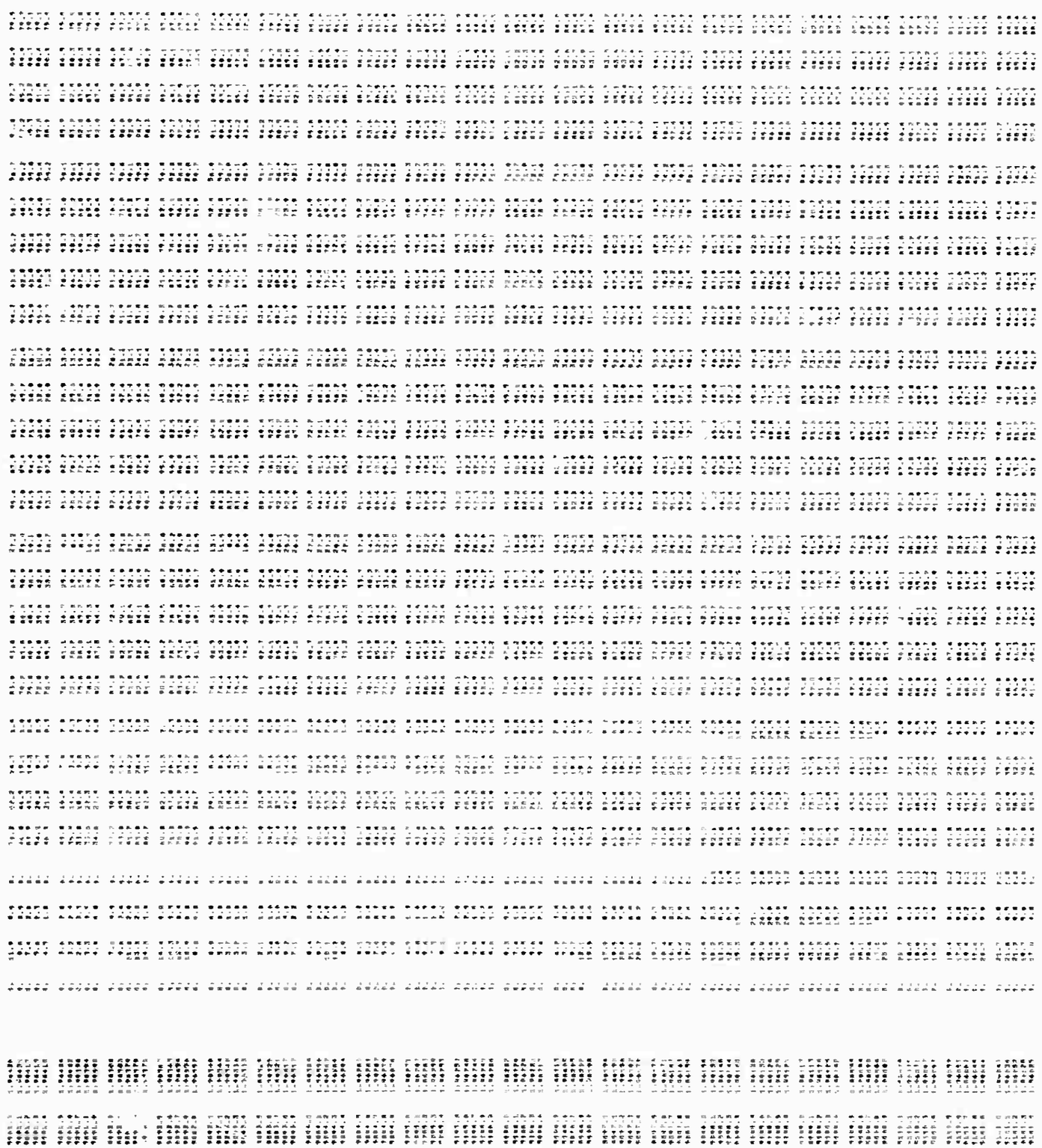

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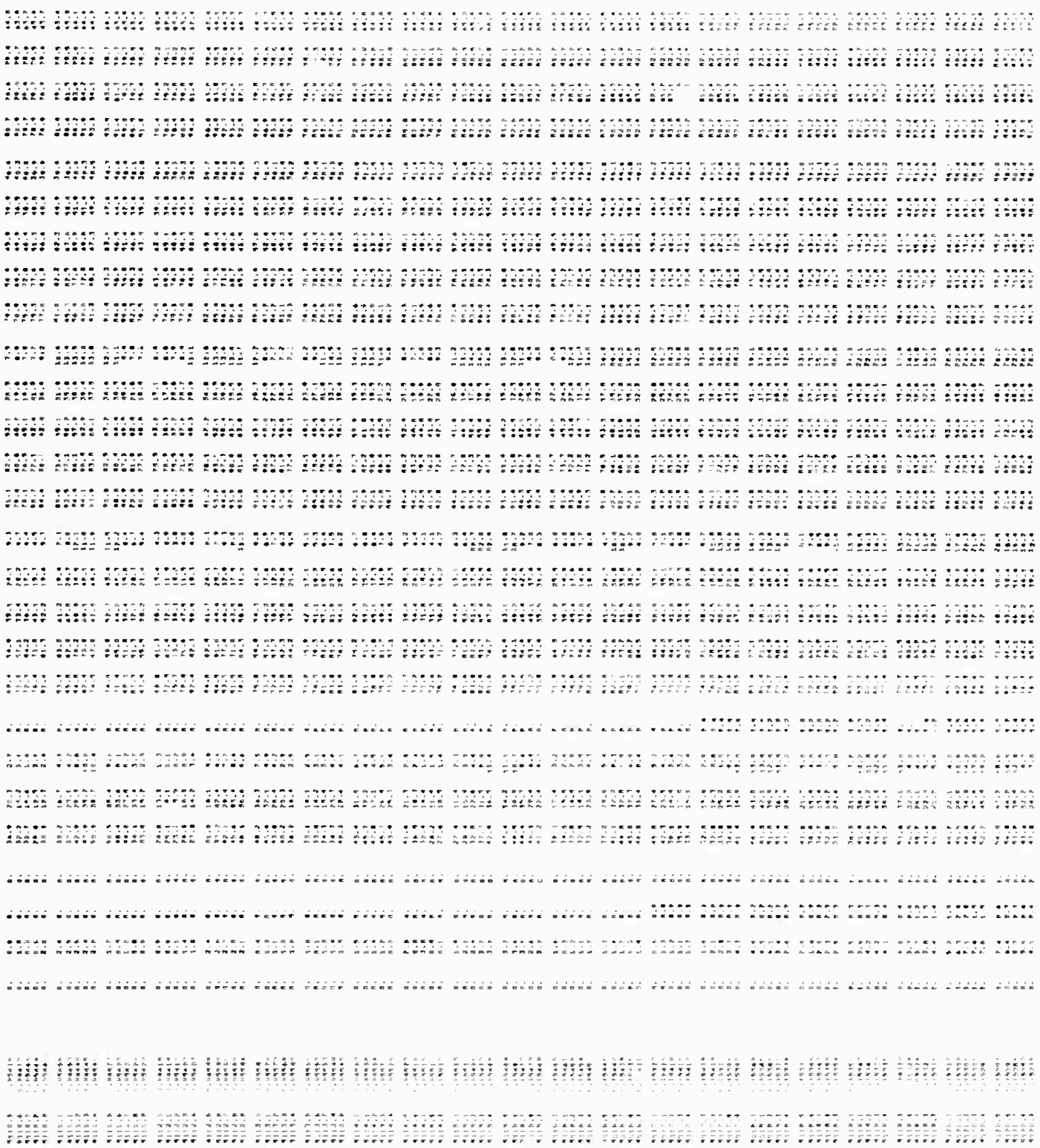

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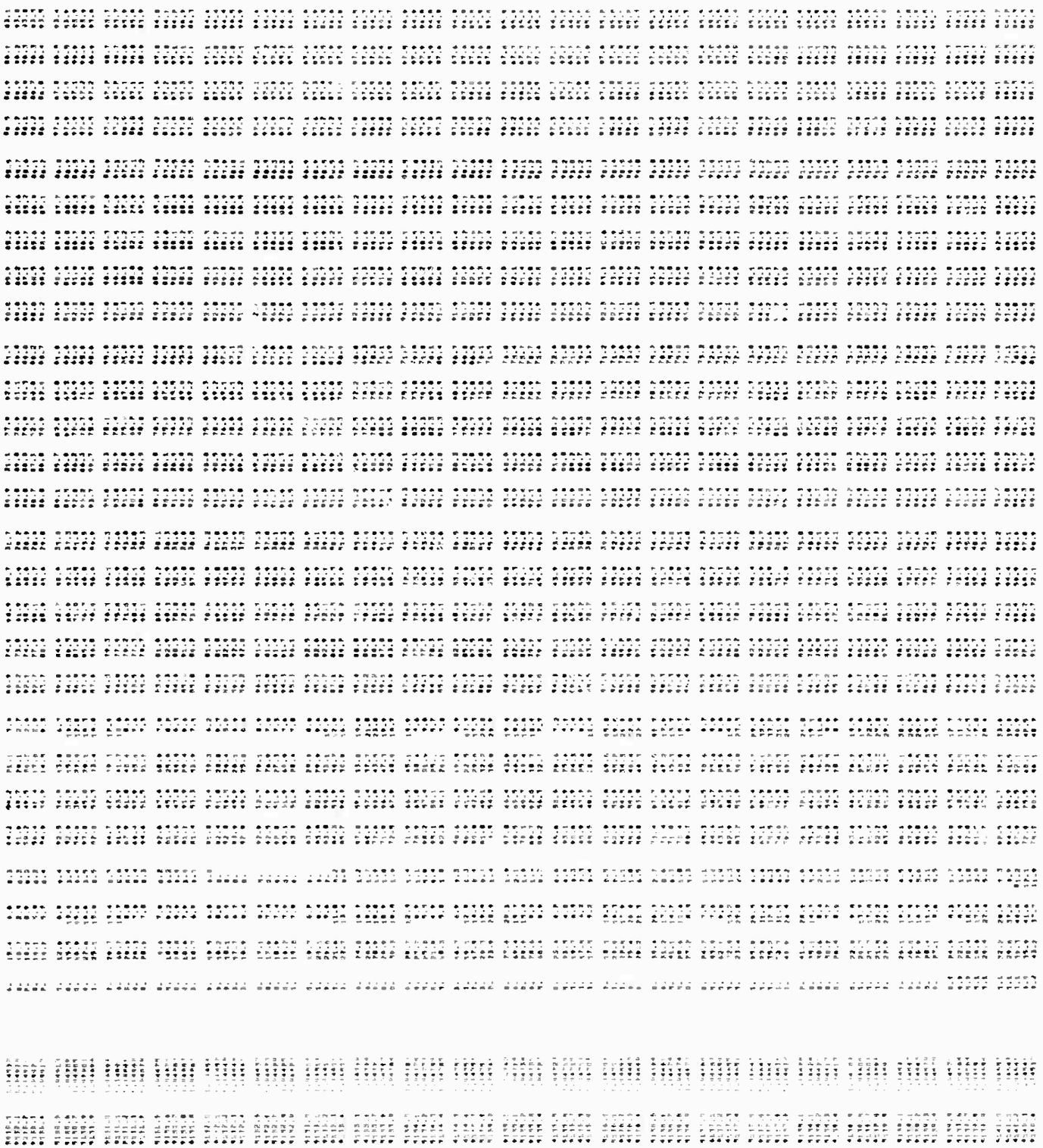

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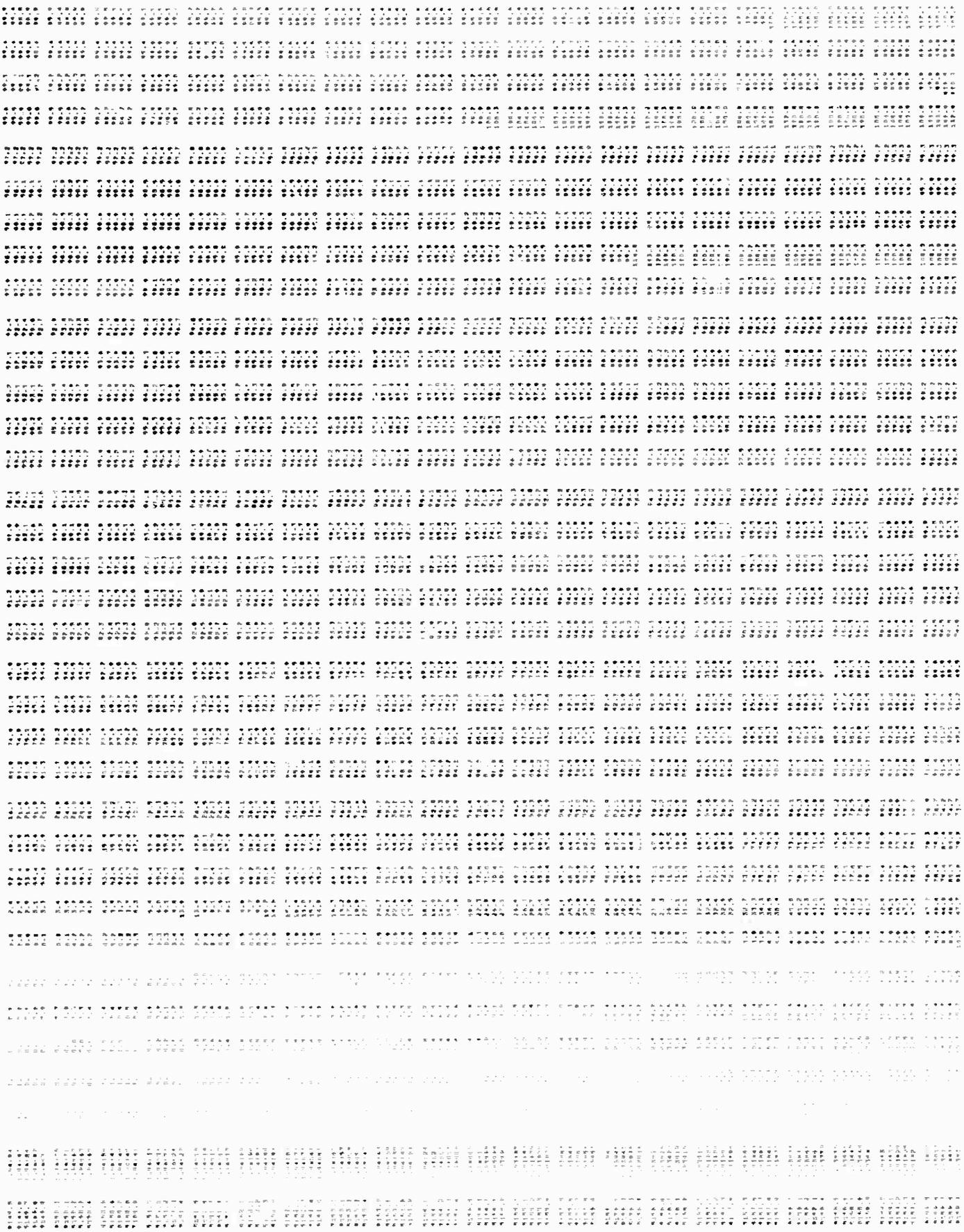


Table 6-1 (continued)

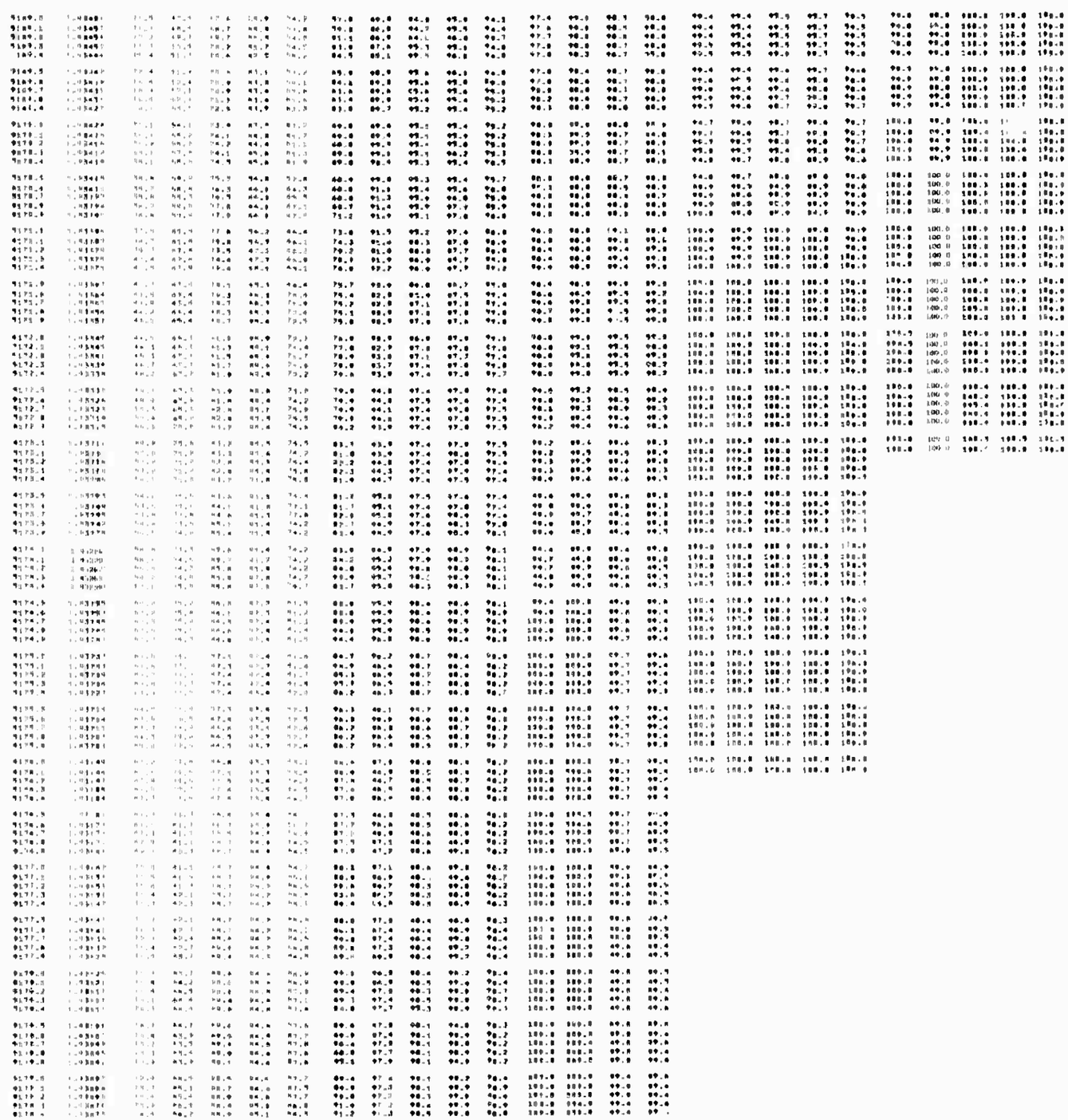
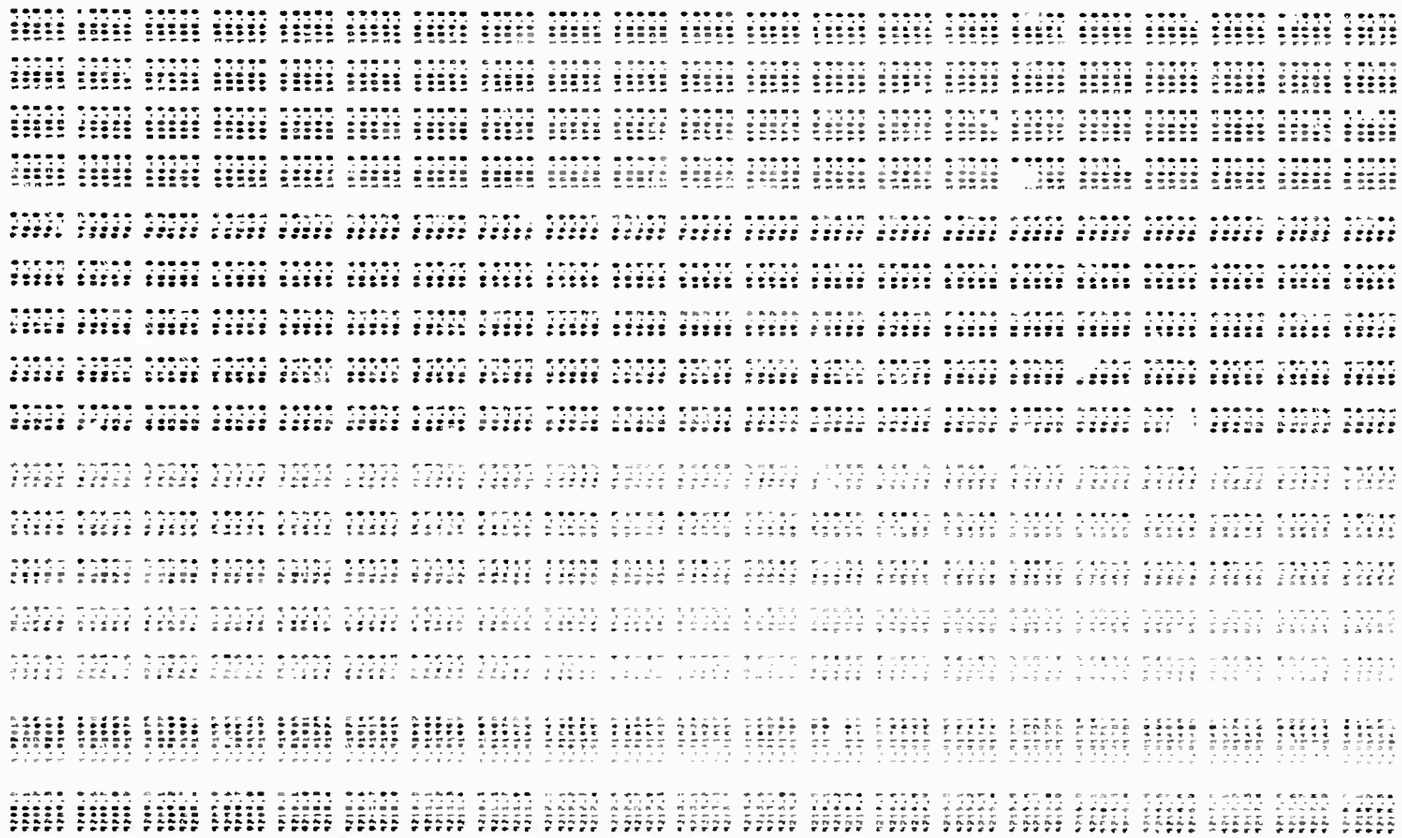


Table 6-1 (continued)

Table 6-1 (continued)



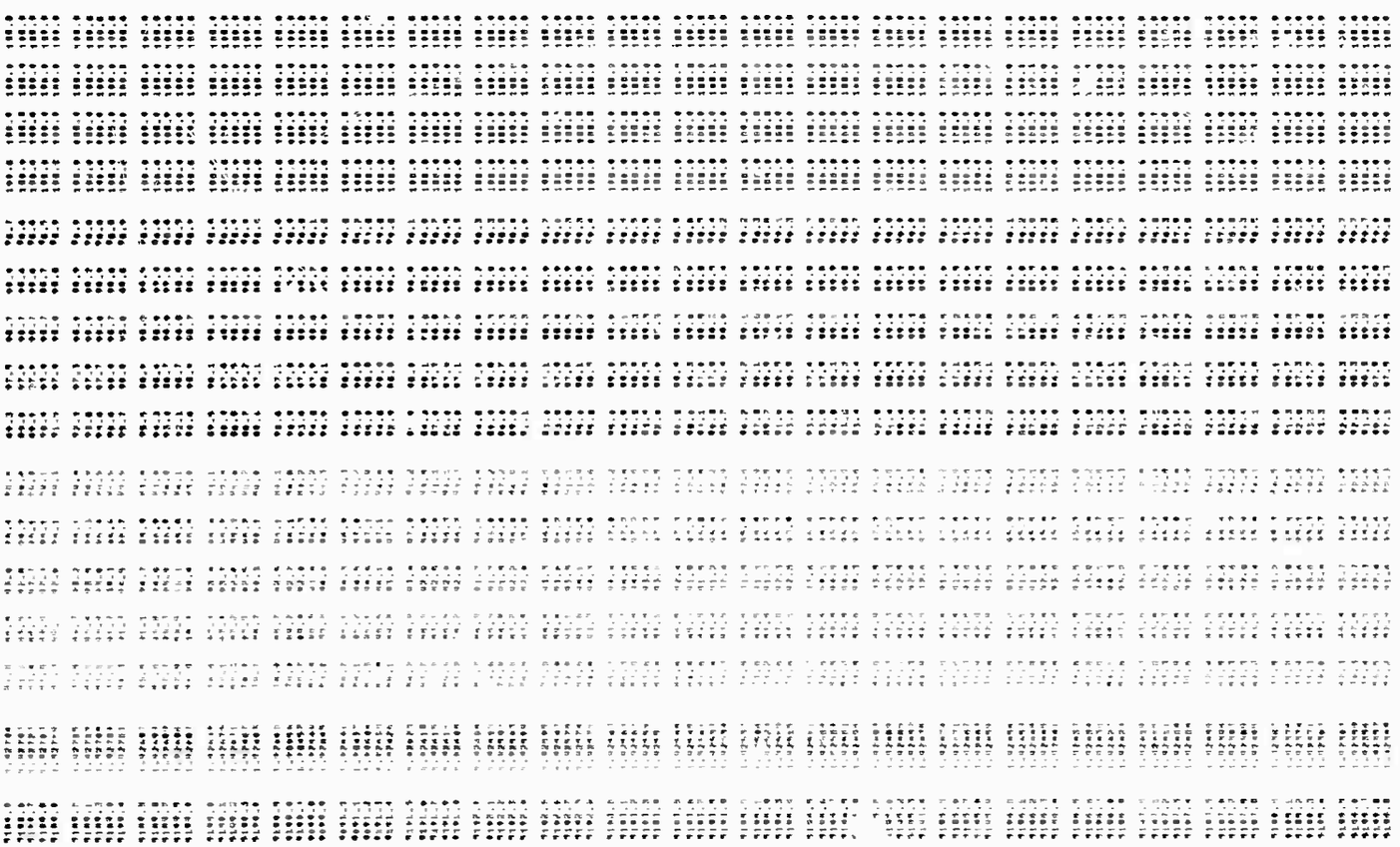
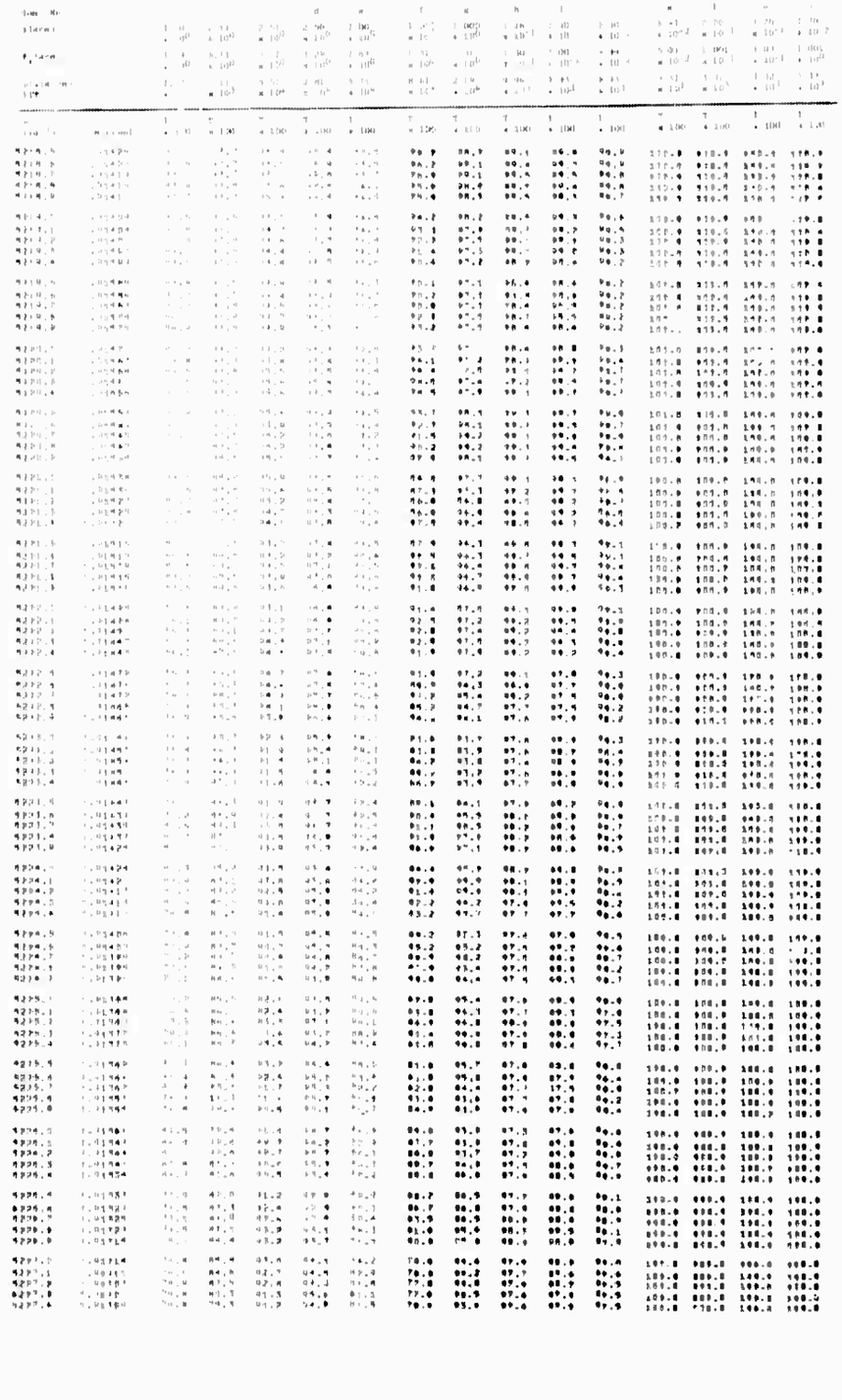
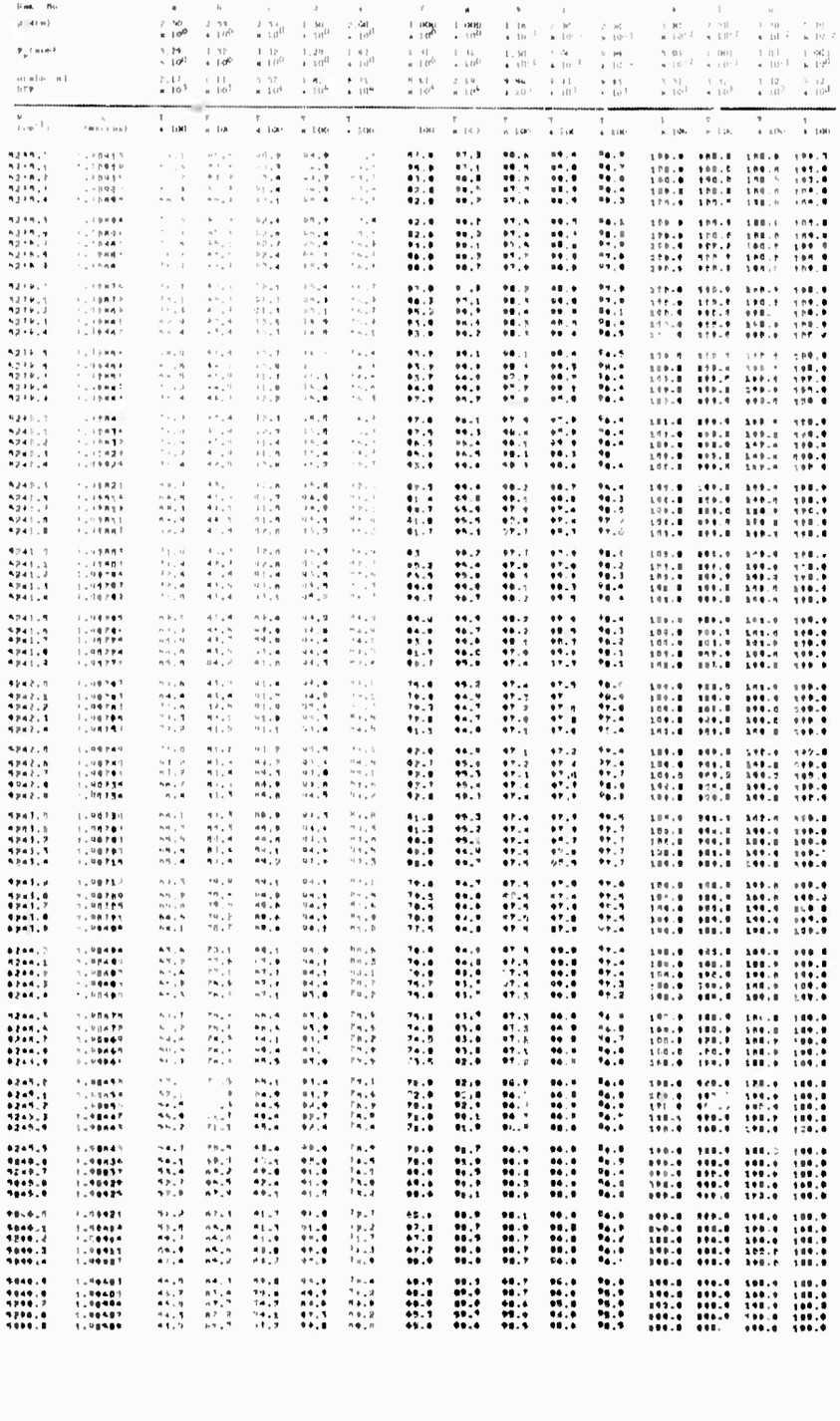
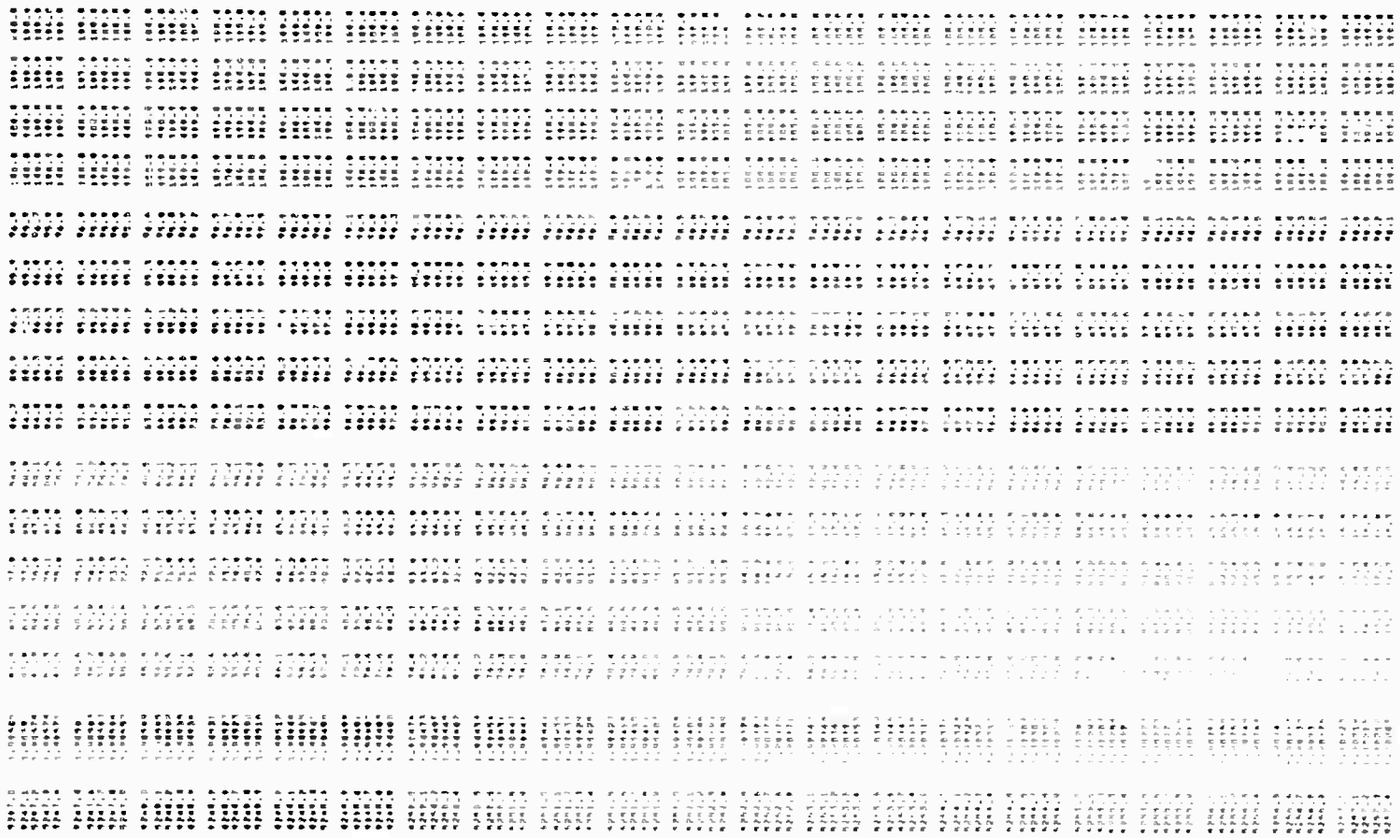


Table 6-1 (continued)







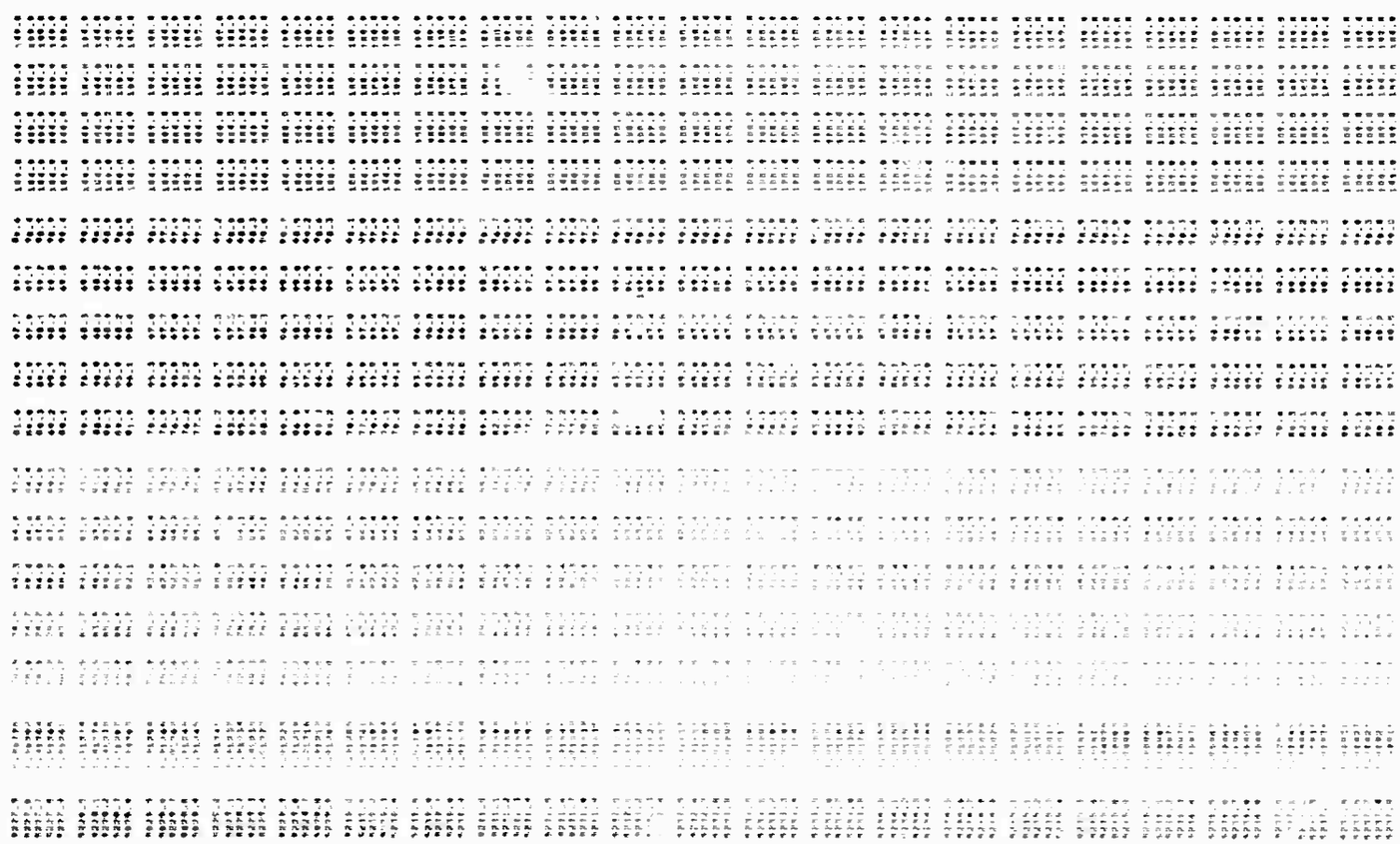
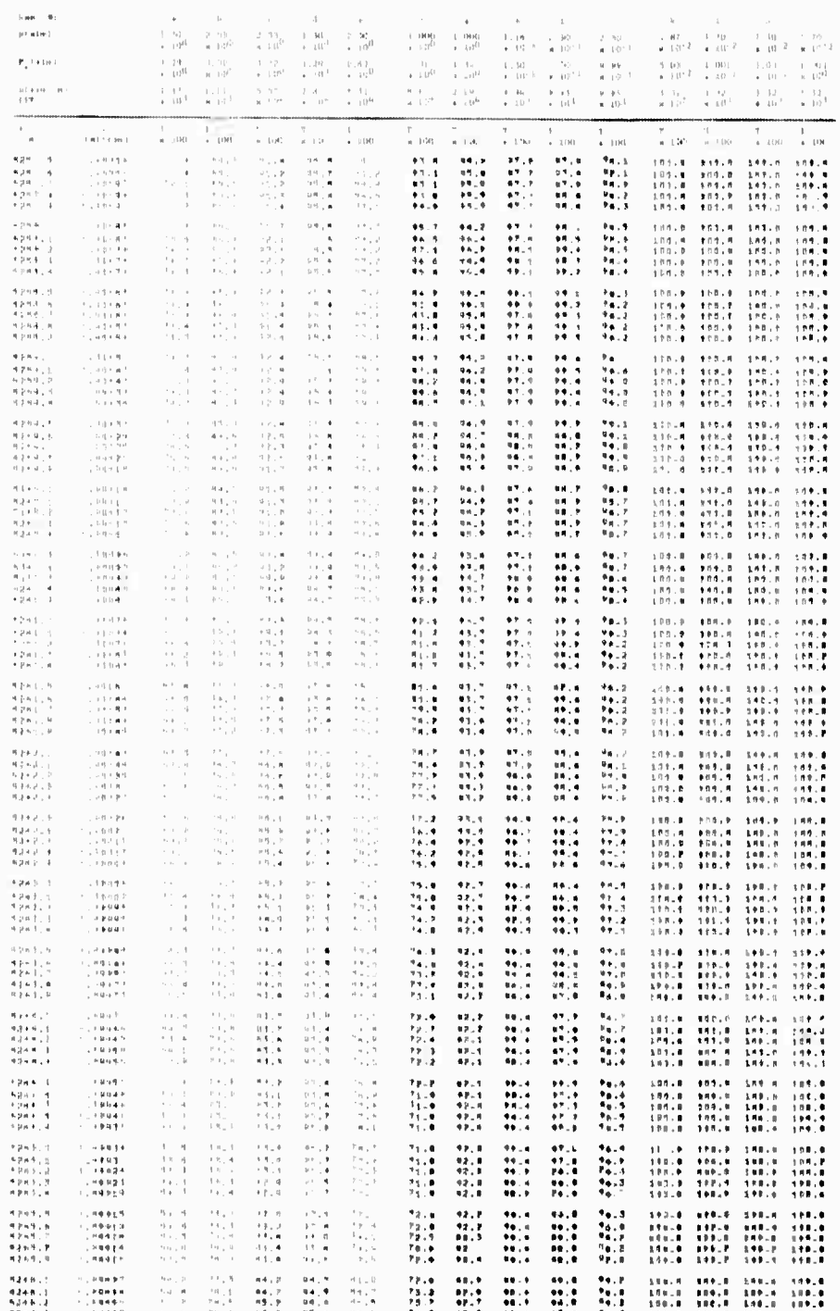
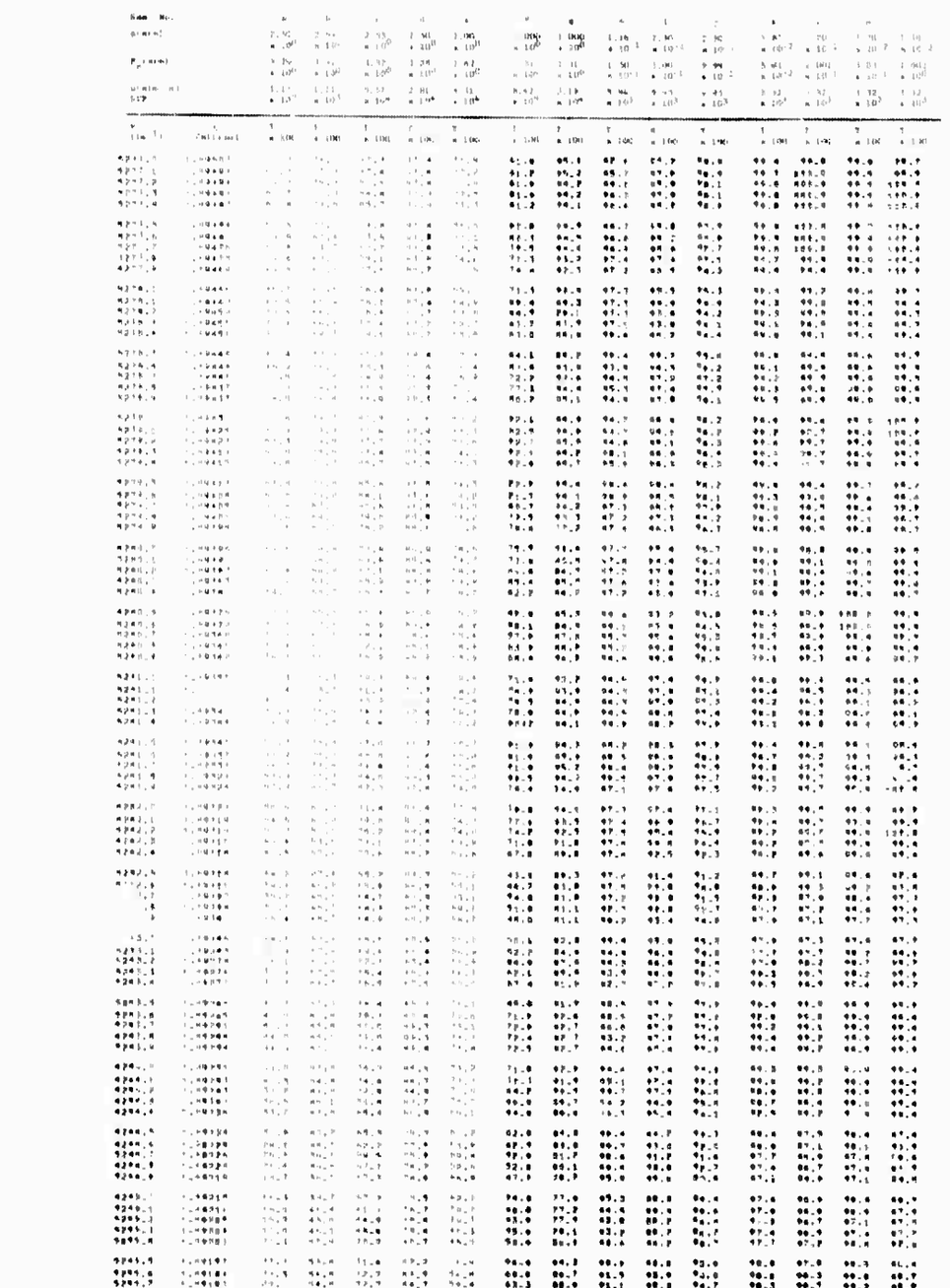
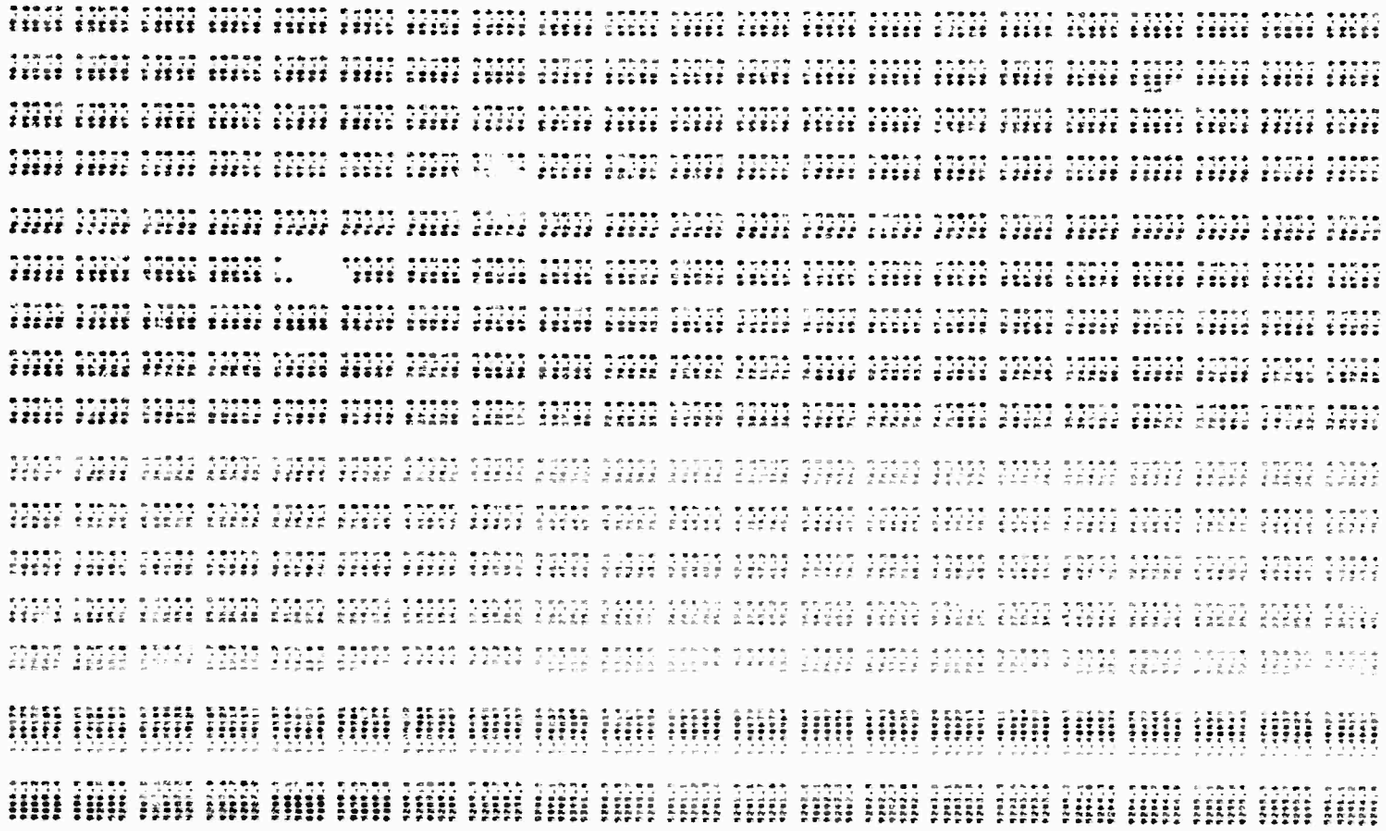


Table 6-1 (continued)







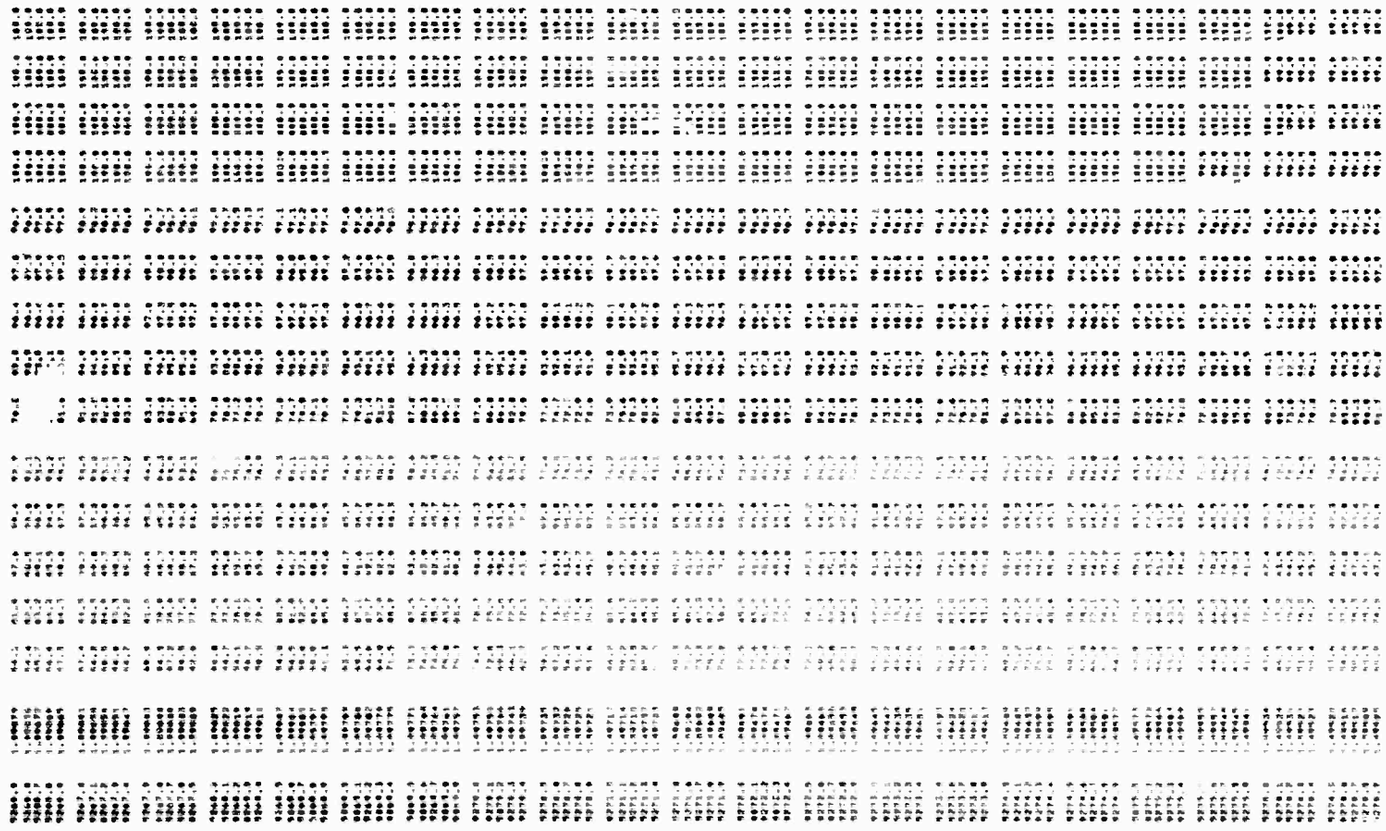
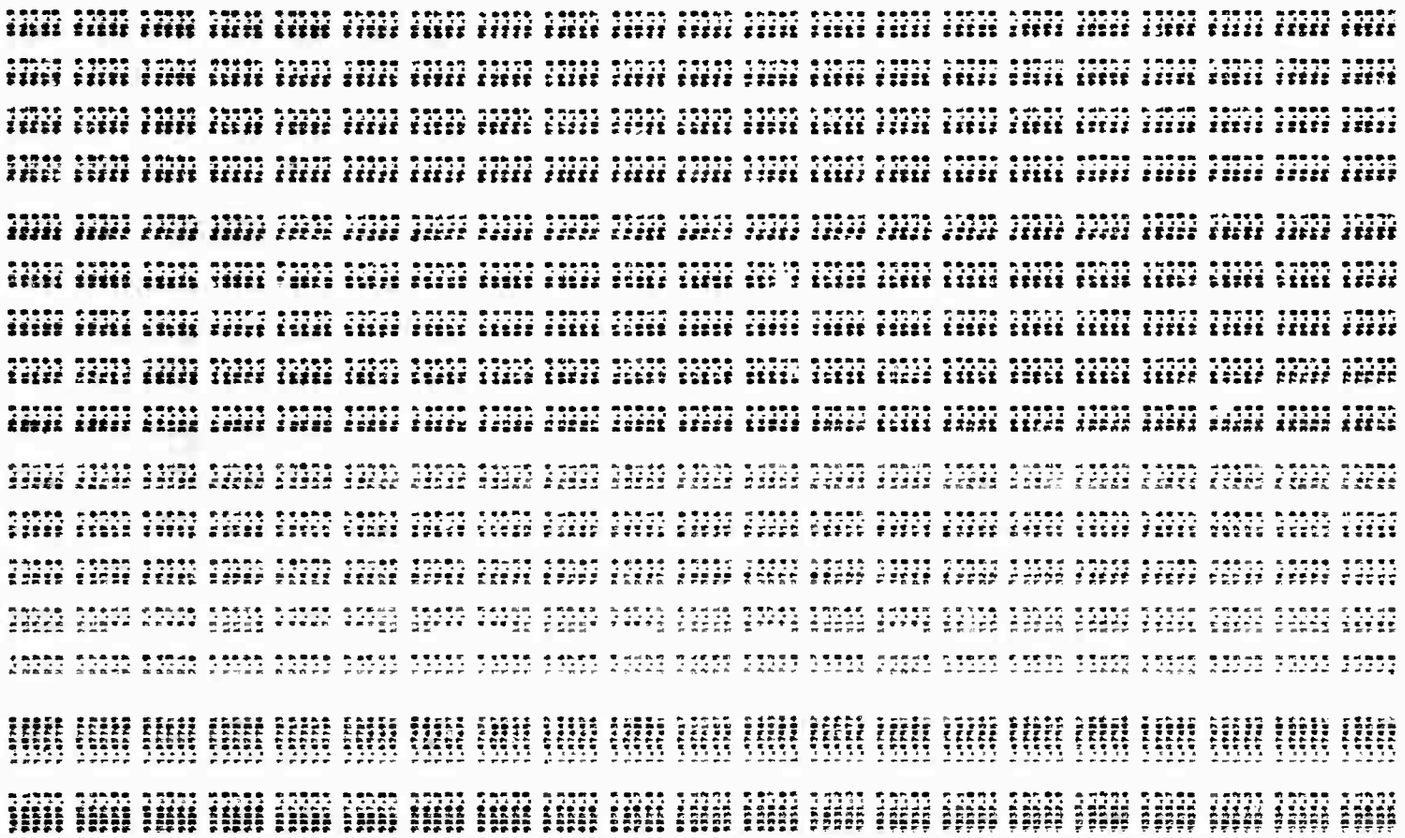


Table 6-1 (continued)

Gas No.		a	b	c	d	e	f	g	h	i	j	k	l	m	n
p(atm)		2.90×10^{0}	2.57×10^{0}	2.51×10^{0}	2.50×10^{0}	2.00×10^{0}	1.000×10^{0}	1.000×10^{0}	1.16×10^{-1}	2.30×10^{-1}	2.30×10^{-1}	3.07×10^{-2}	7.70×10^{-2}	7.70×10^{-2}	7.70×10^{-2}
P_e(atm)		3.28×10^{0}	1.12×10^{0}	3.12×10^{0}	3.29×10^{0}	2.62×10^{0}	1.31×10^{0}	1.31×10^{0}	4.30×10^{-1}	1.00×10^{-1}	9.98×10^{-1}	3.07×10^{-2}	1.001×10^{-1}	3.03×10^{-1}	1.001×10^{-1}
w(atm cm) STP		4.17×10^{3}	1.11×10^{3}	5.57×10^{4}	2.81×10^{4}	8.71×10^{4}	8.62×10^{4}	2.19×10^{4}	8.94×10^{3}	9.95×10^{3}	9.95×10^{3}	3.12×10^{3}	1.32×10^{3}	1.32×10^{3}	1.12×10^{3}
ν (cm^{-1})	λ (microns)	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Gas No.		a	b	c	d	e	f	g	h	i	j	k	l	m	n
p(atm)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P_e(atm)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
w(atm cm) STP		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ν (cm^{-1})	λ (microns)	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100	T × 100
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



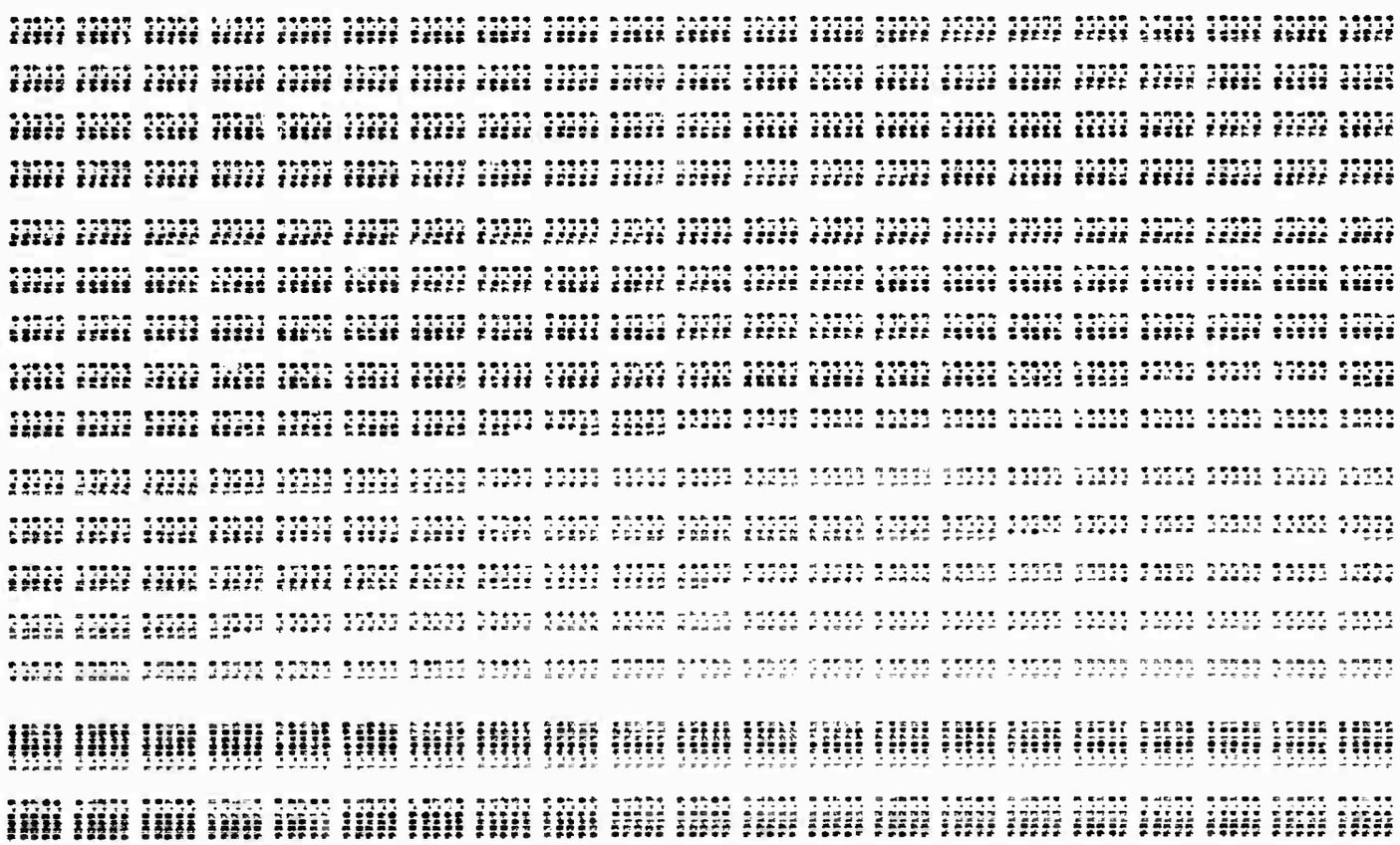


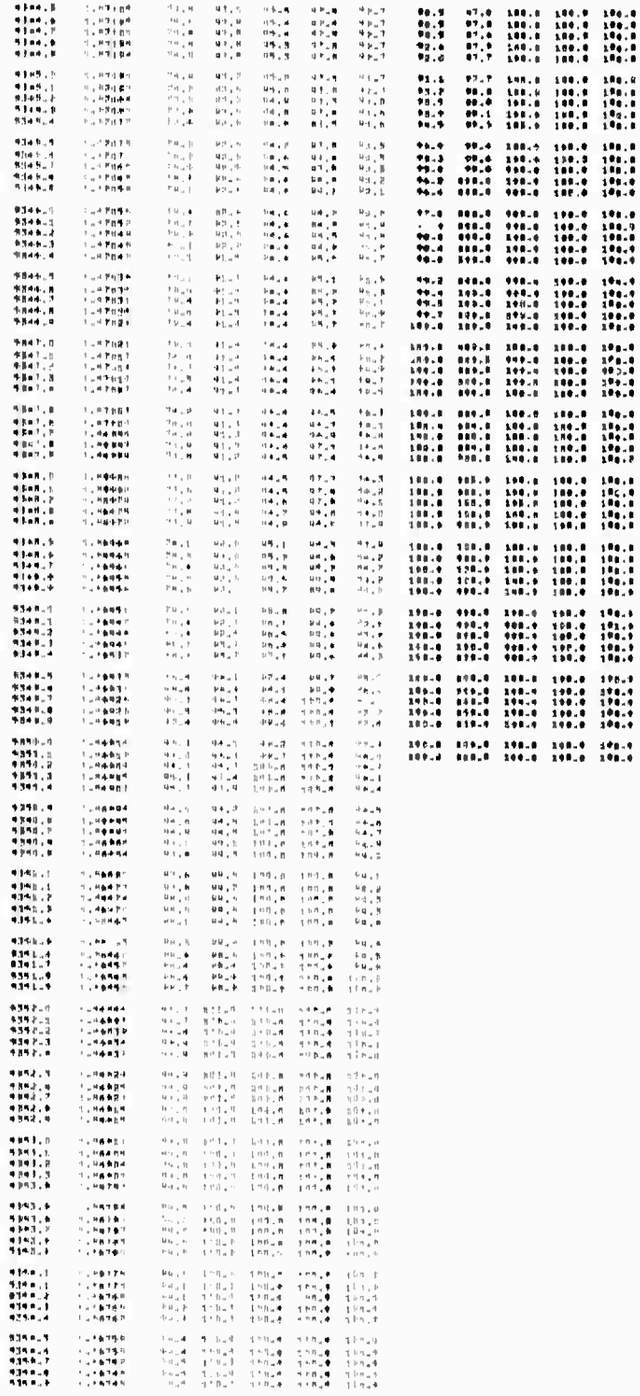
Table 6-1 (continued)

Sam. No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n
p(atm)	3.90 x 10^{0}	2.51 x 10^{0}	3.51 x 10^{0}	2.50 x 10^{0}	2.00 x 10^{0}	1.000 x 10^{0}	1.000 x 10^{0}	1.76 x 10^{-1}	2.30 x 10^{-1}	2.30 x 10^{-1}	5.01 x 10^{-2}	7.76 x 10^{-2}	7.70 x 10^{-2}	7.70 x 10^{-2}
Φ_a(atm)	3.34 x 10^{0}	3.32 x 10^{0}	3.34 x 10^{0}	3.29 x 10^{0}	2.62 x 10^{0}	1.31 x 10^{0}	2.51 x 10^{0}	1.50 x 10^{-1}	1.00 x 10^{-1}	9.44 x 10^{-2}	5.21 x 10^{-2}	1.001 x 10^{-1}	1.03 x 10^{-1}	1.001 x 10^{0}
w(atm cm) BIP	1.24 x 10^{5}	1.11 x 10^{5}	5.51 x 10^{4}	2.81 x 10^{4}	8.71 x 10^{4}	8.42 x 10^{4}	2.19 x 10^{4}	9.44 x 10^{3}	9.41 x 10^{3}	9.41 x 10^{3}	3.32 x 10^{3}	1.32 x 10^{3}	1.32 x 10^{3}	1.32 x 10^{3}

N (cm^{-1})	λ (microns)	T x 100	I x 100	J x 100	K x 100	L x 100	F x 100	G x 100	H x 100	I x 100	J x 100	K x 100	L x 100	M x 100	N x 100
9315.0	1.073034	44.1	19.5	45.7	44.8	35.7	36.8	74.1	91.8	91.0	94.9	96.6	98.9	98.9	99.9
9315.1	1.073023	44.1	19.3	45.1	44.7	35.6	36.8	74.7	92.1	91.9	95.2	96.9	98.7	98.2	99.8
9315.2	1.073011	44.0	19.5	45.0	44.9	35.1	36.8	73.4	92.3	92.3	95.4	97.6	98.7	98.4	99.8
9315.3	1.072999	44.0	19.3	45.1	44.5	35.1	36.3	73.7	92.4	92.6	95.6	97.6	98.6	98.6	99.7
9315.4	1.072987	44.1	19.3	45.6	44.8	35.0	36.9	74.1	92.7	92.5	95.7	97.8	98.9	98.7	99.5
9316.0	1.072961	44.1	19.4	45.7	44.9	35.4	41.1	76.7	92.8	92.8	96.2	97.1	98.9	98.6	99.0
9316.1	1.072949	44.6	20.4	46.4	46.0	35.8	41.8	77.3	93.0	93.0	96.2	97.1	98.9	98.6	99.0
9316.2	1.072937	44.8	20.3	46.4	46.5	36.0	42.8	77.8	93.1	93.0	96.4	97.2	98.9	98.6	98.9
9316.3	1.072924	44.3	20.0	46.0	46.2	35.8	43.0	78.3	93.3	93.2	96.5	97.2	98.9	98.6	98.9
9316.4	1.072912	44.7	20.4	47.0	47.3	36.2	43.7	78.7	93.4	93.3	96.6	97.2	98.9	98.6	98.9
9316.5	1.072900	1	20.5	46.6	47.5	36.1	44.0	79.1	93.5	93.4	96.7	97.3	97.0	98.9	98.9
9316.6	1.072888		20.5	46.7	47.4	36.3	44.3	79.7	93.6	93.5	96.8	97.3	97.1	98.9	98.8
9316.7	1.072876		20.3	46.6	47.4	36.3	44.8	80.3	93.8	93.7	96.8	97.4	97.1	98.9	98.9
9316.8	1.072863		20.3	46.5	46.7	36.2	44.8	80.8	93.9	93.8	96.9	97.4	97.1	98.9	98.9
9316.9	1.072851	44.7	20.7	47.0	48.2	36.3	44.8	81.2	94.0	93.9	96.9	97.5	97.1	98.9	98.9
9317.0	1.072827	44.6	20.4	47.0	48.3	36.4	44.4	81.8	94.2	94.0	96.9	97.5	97.1	98.9	98.9
9317.1	1.072815	44.8	20.1	46.6	48.4	36.4	44.8	82.3	94.3	94.2	97.0	97.5	97.2	98.9	98.9
9317.2	1.072803	44.8	20.2	46.6	48.7	36.7	45.0	82.8	94.4	94.3	97.0	97.5	97.2	98.9	98.9
9317.3	1.072790	44.9	20.1	46.3	48.7	36.8	44.8	83.2	94.5	94.5	97.0	97.5	97.2	98.9	98.9
9317.4	1.072778	45.1	20.2	46.4	48.4	36.6	44.5	83.6	94.6	94.5	97.0	97.7	98.0	98.9	98.9
9317.5	1.072766	45.4	20.4	46.6	48.8	37.0	47.0	84.0	94.8	94.6	97.0	97.7	97.2	98.9	98.9
9317.6	1.072754	45.3	20.3	46.6	48.6	36.9	46.9	84.3	94.9	94.7	97.1	97.7	97.2	98.9	98.9
9317.7	1.072741	45.3	20.5	46.5	48.7	36.9	46.9	84.7	95.0	94.8	97.1	97.7	97.3	98.9	98.9
9317.8	1.072729	45.2	20.4	46.6	48.7	36.9	46.9	85.0	95.1	94.9	97.1	97.7	97.3	98.9	98.9
9317.9	1.072717	45.4	20.3	46.6	48.8	36.9	46.9	85.3	95.2	95.0	97.1	97.7	97.3	98.9	98.9
9318.0	1.072693	45.3	20.4	46.6	48.8	36.9	46.9	85.6	95.3	95.1	97.2	97.7	97.3	98.9	98.9
9318.1	1.072681	45.4	20.4	46.6	48.8	36.9	46.9	85.9	95.4	95.2	97.2	97.7	97.3	98.9	98.9
9318.2	1.072669	45.4	20.4	46.6	48.8	36.9	46.9	86.2	95.5	95.3	97.2	97.7	97.3	98.9	98.9
9318.3	1.072657	45.4	20.4	46.6	48.8	36.9	46.9	86.4	95.6	95.4	97.2	97.7	97.3	98.9	98.9
9318.4	1.072645	45.4	20.4	46.6	48.8	36.9	46.9	86.7	95.7	95.5	97.2	97.7	97.3	98.9	98.9
9318.5	1.072633	45.4	20.4	46.6	48.8	36.9	46.9	86.9	95.8	95.6	97.2	97.7	97.3	98.9	98.9
9318.6	1.072621	45.4	20.4	46.6	48.8	36.9	46.9	87.1	95.8	95.7	97.2	97.7	97.3	98.9	98.9
9318.7	1.072609	45.4	20.4	46.6	48.8	36.9	46.9	87.3	95.9	95.8	97.2	97.7	97.3	98.9	98.9
9318.8	1.072597	45.4	20.4	46.6	48.8	36.9	46.9	87.5	96.0	95.9	97.2	97.7	97.3	98.9	98.9
9318.9	1.072585	45.4	20.4	46.6	48.8	36.9	46.9	87.7	96.0	96.0	97.2	97.7	97.3	98.9	98.9
9319.0	1.072573	45.4	20.4	46.6	48.8	36.9	46.9	87.8	96.1	96.0	97.2	97.7	97.3	98.9	98.9
9319.1	1.072561	45.4	20.4	46.6	48.8	36.9	46.9	88.0	96.1	96.1	97.2	97.7	97.3	98.9	98.9
9319.2	1.072549	45.4	20.4	46.6	48.8	36.9	46.9	88.1	96.2	96.1	97.2	97.7	97.3	98.9	98.9
9319.3	1.072537	45.4	20.4	46.6	48.8	36.9	46.9	88.2	96.2	96.2	97.2	97.7	97.3	98.9	98.9
9319.4	1.072525	45.4	20.4	46.6	48.8	36.9	46.9	88.3	96.3	96.2	97.2	97.7	97.3	98.9	98.9
9319.5	1.072513	45.4	20.4	46.6	48.8	36.9	46.9	88.4	96.3	96.2	97.2	97.7	97.3	98.9	98.9
9319.6	1.072501	45.4	20.4	46.6	48.8	36.9	46.9	88.5	96.3	96.3	97.2	97.7	97.3	98.9	98.9
9319.7	1.072489	45.4	20.4	46.6	48.8	36.9	46.9	88.6	96.4	96.3	97.2	97.7	97.3	98.9	98.9
9319.8	1.072477	45.4	20.4	46.6	48.8	36.9	46.9	88.7	96.4	96.3	97.2	97.7	97.3	98.9	98.9
9319.9	1.072465	45.4	20.4	46.6	48.8	36.9	46.9	88.8	96.4	96.4	97.2	97.7	97.3	98.9	98.9
9320.0	1.072453	45.4	20.4	46.6	48.8	36.9	46.9	88.8	96.4	96.4	97.2	97.7	97.3	98.9	98.9
9320.1	1.072441	45.4	20.4	46.6	48.8	36.9	46.9	88.9	96.5	96.4	97.2	97.7	97.3	98.9	98.9
9320.2	1.072429	45.4	20.4	46.6	48.8	36.9	46.9	89.0	96.5	96.4	97.2	97.7	97.3	98.9	98.9
9320.3	1.072417	45.4	20.4	46.6	48.8	36.9	46.9	89.1	96.5	96.5	97.2	97.7	97.3	98.9	98.9
9320.4	1.072405	45.4	20.4	46.6	48.8	36.9	46.9	89.1	96.5	96.5	97.2	97.7	97.3	98.9	98.9
9320.5	1.072393	45.4	20.4	46.6	48.8	36.9	46.9	89.2	96.6	96.5	97.2	97.7	97.3	98.9	98.9
9320.6	1.072381	45.4	20.4	46.6	48.8	36.9	46.9	89.3	96.6	96.5	97.2	97.7	97.3	98.9	98.9
9320.7	1.072369	45.4	20.4	46.6	48.8	36.9	46.9	89.3	96.6	96.6	97.2	97.7	97.3	98.9	98.9
9320.8	1.072357	45.4	20.4	46.6	48.8	36.9	46.9	89.4	96.6	96.6	97.2	97.7	97.3	98.9	98.9
9320.9	1.072345	45.4	20.4	46.6	48.8	36.9	46.9	89.4	96.7	96.6	97.2	97.7	97.3	98.9	98.9
9321.0	1.072333	45.4	20.4	46.6	48.8	36.9	46.9	89.5	96.7	96.6	97.2	97.7	97.3	98.9	98.9

Sam. No.	m	n	o	p	q
p(atm)	2.91 x 10^{0}	2.51 x 10^{0}	7.51 x 10^{0}	2.50 x 10^{0}	2.00 x 10^{0}
Φ_a(atm)	3.29 x 10^{0}	3.32 x 10^{0}	3.32 x 10^{0}	3.29 x 10^{0}	3.62 x 10^{0}
w(atm cm) BIP	2.17 x 10^{5}	2.11 x 10^{5}	5.57 x 10^{4}	2.83 x 10^{4}	8.71 x 10^{4}

N (cm^{-1})	λ (microns)	T x 100	U x 100	V x 100	W x 100	T x 100
9309.0	1.074741	99.5	100.0	100.0	100.0	100.0
9309.1	1.074729	99.5	100.0	100.0	100.0	100.0
9309.2	1.074716	99.5	100.0	100.0	100.0	100.0
9309.3	1.074704	99.5	100.0	100.0	100.0	100.0
9309.4	1.074692	99.5	100.0	100.0	100.0	100.0
9309.5	1.074679	99.5	100.0	100.0	100.0	100.0
9309.6	1.074667	99.5	100.0	100.0	100.0	100.0
9309.7	1.074654	99.5	100.0	100.0	100.0	100.0
9309.8	1.074642	99.5	100.0	100.0	100.0	100.0
9309.9	1.074630	99.5	100.0	100.0	100.0	100.0
9310.0	1.074617	99.5	100.0	100.0	100.0	100.0
9310.1	1.074605	99.5	100.0	100.0	100.0	100.0
9310.2	1.074593	99.5	100.0	100.0	100.0	100.0
9310.3	1.074580	99.5	100.0	100.0	100.0	100.0
9310.4	1.074568	99.5	100.0	100.0	100.0	100.0
9310.5	1.074555	99.5	100.0	100.0	100.0	100.0
9310.6	1.074543	99.5	100.0	100.0	100.0	100.0
9310.7	1.074531	99.5	100.0	100.0	100.0	100.0
9310.8	1.074518	99.5	100.0	100.0	100.0	100.0
9310.9	1.074506	99.5	100.0	100.0	100.0	100.0
9311.0	1.074494	99.5	100.0	100.0	100.0	100.0
9311.1	1.074481	99.5	100.0	100.0	100.0	100.0
9311.2	1.074469	99.5	100.0	100.0	100.0	100.0
9311.3	1.074457	99.5	100.0	100.0	100.0	100.0
9311.4	1.074444	99.5	100.0	100.0	100.0	100.0
9311.5	1.074432	99.5	100.0	100.0	100.0	100.0
9311.6	1.074420	99.5	100.0	100.0	100.0	100.0
9311.7	1.074407	99.5	100.0	100.0	100.0	100.0
9311.8	1.074395	99.5	100.0	100.0	100.0	100.0
9311.9	1.074383	99.5	100.0	100.0	100.0	100.0
9312.0	1.074370	99.5	100.0	100.0	100.0	100.0
9312.1	1.074358	99.5	100.0	100.0	100.0	100.0
9312.2	1.074346	99.5	100.0	100.0	100.0	100.0
9312.3	1.074333	99.5	100.0	100.0	100.0	100.0
9312.4	1.074321	99.5	100.0	100.0	100.0	100.0
9312.5	1.074309	99.5	100.0	100.0	100.0	100.0
9312.6	1.074296	99.5	100.0	100.0	100.0	100.0
9312.7	1.074284	99.5	100.0	100.0	100.0	100.0
9312.8	1.074272	99.5	100.0	100.0	100.0	100.0
9312.9	1.074259	99.5	100.0	100.0	100.0	100.0
9313.0	1.074247	99.5	100.0	100.0	100.0	100.0
9313.1	1.074235	99.5	100.0	100.0	100.0	100.0
9313.2	1.074222	99.5	100.0	100.0	100.0	100.0
9313.3	1.074210	99.5	100.0	100.0	100.0	100.0
9313.4	1.074198	99.5	100.0	100.0	100.0	100.0
9313.5	1.074185	99.5	100.0	100.0	100.0	100.0
9313.6	1.074173	99.5	100.0	100.0	100.0	100.0
9313.7	1.074161	99.5	100.0	100.0	100.0	100.0
9313.8	1.074148	99.5	100.0	100.0	100.0	100.0
9313.9	1.074136	99.5	100.0	100.0	100.0	100.0
9314.0	1.074124	99.5	100.0	100.0	100.0	100.0
9314.1	1.074111	99.5	100.0	100.0	100.0	100.0
9314.2	1.074099	99.5	100.0	100.0	100.0	100.0
9314.3	1.074087	99.5	100.0	100.0	100.0	100.0
9314.4	1.074074	99.5	100.0	100.0	100.0	100.0
9314.5	1.074062	99.5	100.0	100.0	100.0	100.0
9314.6	1.074050	99.5	100.0	100.0	100.0	100.0
9314.7	1.074037	99.5	100.0	100.0	100.0	100.0
9314.8	1.074025	99.5	100.0	100.0	100.0	100.0
9314.9	1.074013	99.5	100.0	100.0	100.0	100.0
9315.0	1.074000	99.5	100.0	100.0	100.0	100.0
9315.1	1.073988	99.5	100.0	100.0	100.0	100.0
9315.2	1.073976	99.5	100.0	100.0	100.0	100.0
9315.3	1.073963	99.5	100.0	100.0	100.0	100.0
9315.4	1.073951	99.5	100.0	100.0	100.0	100.0
9315.5	1.073939	99.5	100.0	100.0	100.0	100.0
9315.6	1.073926	99.5	100.0	100.0	100.0	100.0
9315.7	1.073914	99.5	100.0	100.0	100.0	100.0
9315.8	1.073902	99.5	100.0	100.0	100.0	100.0
9315.9	1.073889	99.5	100.0	100.0	100.0	100.0
9316.0	1.073865	99.5	100.0	100.0	100.0	100.0
9316.1	1.073853	99.5	100.0	100.0	100.0	100.0
9316.2	1.073840	99.5	100.0	100.0	100.0	100.0
9316.3	1.073828	99.5	100.0	100.0	100.0	100.0
9316.4	1.073816	99.5	100.0	100.0	100.0	100.0
9316.5	1.073803	99.5	100.0	100.0	100.0	100.0
9316.6	1.073791	99.5	100.0	100.0	100.0	100.0
9316.7	1.073779	99.5	100.0	100.0	100.0	100.0
9316.8	1.073766	99.5	100.0	100.0	100.0	100.0
9316.9	1.073754	99.5	100.0	100.0	100.0	100.0
9317.0	1.073742	99.5	100.0	100.0	100.0	100.0
9317.1	1.073729	99.5	100.0	100.0	100.0	100.0
9317.2	1.073717	99.5	100.0	100.0	100.0	100.0
9317.3	1.073705	99.5	100.0	100.0	100.0	100.0
9317.4	1.073692	99.5	100.0	100.0	100.0	100.0
9317.5	1.073680	99.5	100.0	100.0	100.0	100.0
9317.6	1.073668	99.5	100.0	100.0	100.0	100.0
9317.7	1.073655	99.5	100.0	100.0	100.0	100.0
9317.8	1.073643	99.5	100.0	100.0	100.0	100.0
9317.9	1.073631	99.5	100.0	100.0	100.0	100.0
9318.0	1.073618	99.5	100.0	100.0	100.0	100.0
9318.1	1.073606	99.5	100.0	100.0	100.0	100.0
9318.2	1.073594	99.5	100.0	100.0	100.0	100.0
9318.3	1.073581	99.5	100.0	100.0	100.0	100.0
9318.4	1.073569	99.5	100.0	100.0	100.0	100.0
9318.5	1.073557	99.5	100.0	100.0	100.0	100.0
9318.6	1.073544	99.5	100.0	100.0	100.0	100.0
9318.7	1.073532	99.5	100.0	100.0	100.0	100.0
9318.8	1.073520	99.5	100.0	100.0	100.0	100.0
9318.9	1.073507	99.5	100.0	100.0	100.0	100.0
9319.0	1.073495	99.5	100.0	100.0	100.0	100.0
9319.1	1.073483	99.5	100.0	100.0	100.0	100.0
9319.2	1.073470	99.5	100.0	100.0	100.0	100.0
9319.3	1.073458	99.5	100.0	100.0	100.0	100.0
9319.4	1.073446	99.5	100.0	100.0	100.0	100.0
9319.5	1.073433	99.5	100.0	100.0	100.0	100.0
9319.6	1.073421	99.5	100.0	100.0	100.0	100.0
9319.7	1.073409	99.5	100.0	100.0	100.0	100.0
9319.8	1.073396	99.5	100.0	100.0	100.0	100.0
9319.9	1.073384	99.5	100.0	100.0	100.0	100.0
9320.0	1.073372	99.5	100.0	100.0	100.0	100.0
9320.1	1.073359	99.5	100.0	100.0	100.0	100.0
9320.2	1.073347	99.5	100.0	100.0	100.0	100.0
9320.3	1.073335	99.5	100.0	100.0	100.0	100.0
9320.4	1.073322	99.5	100.0	100.0	100.0	100.0
9320.5	1.073310	99.5	100.0	100.0	100.0	100.0
9320.6	1.073298	99.5	100.0	100.0	100.0	100.0
9320.7	1.073285	99.5	100.0	100.0	100.0	100.0
9320.8	1.073273	99.5	100.0	100.0	100.0	100.0
9320.9	1.073261	99.5	100.0	100.0	100.0	100.0
9321.0	1.073248	99.5	100.0	100.0	100.0	100.0



SECTION 7

TABLE OF INTEGRATED ABSORPTANCE

Values of the integrated absorptance are presented in Table 7-1 for the samples which are listed in Table 4-1 and whose spectra and tables of transmittance are included in Sections 5 and 6, respectively. Except for wavenumbers near the ends of the spectral region of interest, all the tabulations for a given spectral interval are contained on two successive pages. A single page was sufficient to contain all the tabulations for the samples considered near the ends of the spectral region covered by the table.

The lower limit of integration ν^1, which is shown at the top of each column, was chosen at a point where there was essentially no absorption. The integrated absorptance between any two wavenumbers listed can be found by subtracting the values tabulated at the two points. The accuracy of a given value of the integrated absorptance does not justify all of the significant figures which are carried in the table. But all these figures must be retained in order to avoid losing information about the integrated absorptance over narrow intervals which is obtained by subtracting the tabulated values. The table was formed by photographing part of the computer output with the proper headings pieced in above each section.

The integrated absorptance at a given ν was calculated by the computer from the values of transmittance given in Table 6-1 by the following expression.

$$\int_{\nu^1}^{\nu} \left[1 - T(\nu)\right] d\nu = \left[\sum_{\nu=\nu^1}^{\nu} \left[1 - T(\nu)\right] \Delta\nu\right] - \frac{\left[1 - T(\nu^1)\right] + \left[1 - T(\nu)\right]}{2} \Delta\nu,$$

where $\Delta\nu = 0.1\ cm^{-1}$, the wavenumber interval between successive values of $T(\nu)$ in Table 6-1.

The important sample parameters are listed at the heading of each page.

In regions where the structure in the spectra is regular, the integrated absorptance was calculated at wavenumbers midway between the line centers. Therefore, in the case of no overlapping, the difference between two successive tabulated values is the equivalent width of the absorption line in the interval. In some other regions where the structure was not particularly regular, the integrated absorptance was calculated at wavenumbers corresponding to absorptance minima. In still other regions where there was but little structure or where the absorptance minima would shift as the pressure or absorber thickness was changed, the values were calculated at integral wavenumbers or possibly at integral half-wavenumbers, depending on the amount of information one might expect to obtain from closer readings.

Table 7-1 $\left[\int_0^\infty (1-T)d\nu\right]$

Sam. Nr.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
p(atm)	3.38 ± 10⁰	2.53 ± 10⁰	2.53 ± 10⁰	2.30 ± 10⁰	2.00 ± 10⁰	1.000 ± 10⁰	1.000 ± 10⁰	1.14 ± 10⁻¹	8.30 ± 10⁻¹	3.38 ± 10⁻¹	3.97 ± 10⁻²	7.70 ± 10⁻³	7.70 ± 10⁻²	7.70 ± 10⁻²	1.16 ± 10⁻²	2.34 ± 10⁻³	8.34 ± 10⁻³	2.34 ± 10⁻³	6.67 ± 10⁻³
ℓ_a(cm)	1.29 ± 10⁰	3.32 ± 10⁰	3.32 ± 10⁰	3.29 ± 10⁰	2.62 ± 10⁰	1.31 ± 10⁰	1.31 ± 10⁰	1.30 ± 10⁻¹	3.00 ± 10⁻¹	9.91 ± 10⁻¹	9.03 ± 10⁻²	1.001 ± 10⁻¹	3.03 ± 10⁻¹	1.00 ± 10⁰	1.53 ± 10⁻²	3.06 ± 10⁻³	1.02 ± 10⁻¹	3.00 ± 10⁻¹	9.70 ± 10⁻¹
u(atm cm) OR	2.17 ± 10³	1.11 ± 10³	3.37 ± 10⁴	2.03 ± 10⁴	9.71 ± 10⁴	9.02 ± 10⁴	2.16 ± 10⁴	9.96 ± 10³	8.65 ± 10³	7.65 ± 10³	3.32 ± 10³	3.88 ± 10³	8.32 ± 10³	3.32 ± 10³	1.01 ± 10³	1.01 ± 10³	1.01 ± 10³	1.01 ± 10³	1.01 ± 10³

ν (cm⁻¹)	ν=4336 cm⁻¹	ν=4334 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4336 cm⁻¹	ν=4378.0 cm⁻¹	ν=4378.3 cm⁻¹	ν=4378.3 cm⁻¹	ν=4378.3 cm⁻¹	ν=4706 cm⁻¹	ν=4706 cm⁻¹	ν=4706 cm⁻¹	ν=4706 cm⁻¹	ν=4706 cm⁻¹
4514.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.									
4517.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.									
4519.5	0.101	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.									
4519.8	0.089	0.060	0.	0.	0.	0.	0.	0.	0.	0.	0.									
4521.0	0.013	0.045	0.	0.	0.	0.000	0.000	0.	0.	0.	0.									
4541.0	0.013	0.048	0.	0.	0.	0.000	0.000	0.	0.	0.	0.									
4543.0	0.039	0.017	0.	0.	0.	0.000	0.001	0.	0.	0.	0.									
4543.6	0.006	0.027	0.	0.	0.000	0.000	0.000	0.	0.	0.	0.									
4544.5	0.001	0.001	0.002	0.	0.014	0.010	0.005	0.	0.	0.	0.									
4545.8	0.149	0.157	0.007	0.	0.000	0.000	0.000	0.	0.	0.001	0.									
4547.3	0.178	0.181	0.025	0.	0.076	0.000	0.019	0.	0.016	0.										
4546.9	0.208	0.136	0.035	0.017	0.117	0.000	0.010	0.	0.039	0.000										
4548.6	0.316	0.172	0.051	0.015	0.202	0.100	0.000	0.000	0.048	0.010										
4552.2	0.469	0.224	0.074	0.021	0.288	0.169	0.000	0.919	0.057	0.001										
4553.6	0.567	0.277	0.102	0.012	0.264	0.210	0.000	0.000	0.047	0.000										
4559.4	0.625	0.344	0.139	0.004	0.026	0.269	0.006	0.000	0.001	0.007										
4562.8	0.765	0.429	0.174	0.005	0.414	0.338	0.070	0.047	0.049	0.044										
4568.6	0.927	0.549	0.219	0.041	0.515	0.405	0.090	0.056	0.110	0.009										
4570.2	1.067	0.698	0.280	0.100	0.613	0.488	0.116	0.069	0.109	0.067										
4573.9	1.287	0.717	0.305	0.113	0.713	0.568	0.109	0.091	0.141	0.070										
4583.6	1.489	0.879	0.359	0.161	0.816	0.661	0.150	0.095	0.168	0.060										
4585.5	1.697	0.960	0.411	0.162	0.920	0.739	0.197	0.088	0.188	0.111										
4586.6	1.912	1.064	0.467	0.193	1.035	0.836	0.211	0.017	0.210	0.102										
4589.2	2.139	1.167	0.523	0.225	1.144	0.906	0.248	0.107	0.228	0.108										
4590.8	2.369	1.314	0.579	0.250	1.255	1.019	0.276	0.098	0.240	0.178										
4571.3	2.967	1.614	0.631	0.253	1.357	1.086	0.319	0.081	0.261	0.188										
4570.6	3.744	1.921	0.687	0.275	1.447	1.175	0.348	0.074	0.277	0.186										
4574.5	3.929	2.071	0.727	0.294	1.544	1.250	0.363	0.100	0.289	0.216										
4576.8	4.091	2.219	0.764	0.328	1.629	1.328	0.383	0.102	0.306	0.200										
4577.7	4.265	2.348	0.819	0.326	1.719	1.368	0.403	0.082	0.324	0.240										
4574.3	4.431	2.464	0.868	0.341	1.817	1.468	0.408	0.089	0.342	.260	0.	0.	0.	0.						
4581.3	4.487	2.579	0.901	0.356	1.918	1.568	0.428	0.041	0.389	.278	0.	0.	0.	0.						
4582.6	4.722	2.678	0.934	0.364	1.983	1.576	0.483	0.000	0.379	0.000	0.	0.	0.	0.						
4583.8	4.839	2.784	0.956	0.376	2.045	1.612	0.468	0.000	0.361	0.097	0.	0.	0.	0.	0.000					
4585.0	4.891	2.844	0.983	0.367	2.113	1.698	0.478	0.069	0.402	0.080	0.	0.	0.	0.	0.051					
4586.8	4.169	2.228	1.248	0.905	2.187	1.718	0.488	0.076	0.411	0.016	0.	0.	0.	0.	0.089					
4589.0	4.277	2.318	1.298	0.423	2.271	1.768	0.508	0.000	0.484	0.000	0.	0.	0.	0.	0.085					
4590.8	4.474	2.472	1.354	0.447	2.361	1.866	0.887	0.085	0.936	0.046	0.	0.	0.	0.	0.078					
4592.2	4.711	2.568	1.398	0.476	2.469	1.958	0.847	0.068	0.985	0.085	0.	0.	0.	0.006	0.053					
4593.0	4.938	2.666	1.438	0.492	2.586	2.068	0.877	0.388	0.471	0.074	0.	0.	0.	0.007	0.059					
4591.0	4.167	2.461	1.338	0.896	2.787	0.190	0.619	0.397	0.488	0.088	0.	0.	0.	0.918	0.016					
4592.2	4.424	2.577	1.444	0.644	2.888	2.888	0.643	0.878	0.898	0.488	0.	0.	0.	0.818	0.888					
4592.9	4.814	2.873	1.522	0.875	2.886	2.356	0.668	0.888	0.921	0.416	0.	0.	0.	0.818	0.888					
4595.8	4.744	3.153	1.745	0.847	3.888	2.458	0.888	0.868	0.978	0.488	0.	0.818	0.888	0.888	0.824					
4596.1	4.873	3.319	1.851	0.849	0.155	2.878	0.717	0.488	0.958	0.448	0.	0.888	0.888	0.888	0.889					
4599.6	4.451	3.921	1.761	0.745	0.342	0.718	0.758	0.429	0.876	0.477	0.	0.811	0.828	0.828	0.897					
4596.8	4.946	3.742	1.875	0.767	0.935	0.888	0.886	0.447	0.638	0.987	0.	0.816	0.883	0.883	0.881					
4597.6	5.274	3.944	2.004	0.854	3.751	0.878	0.891	0.471	0.628	0.988	0.	0.826	0.888	0.888	0.888					
4599.1	5.761	4.277	2.257	0.974	4.101	3.818	0.886	0.468	0.661	0.977	0.	0.838	0.886	0.886	0.878					
4618.3	6.154	4.545	2.523	1.014	4.264	3.988	0.873	0.838	0.698	0.618	0.	0.892	0.948	0.948	0.841					
4601.0	4.918	4.927	2.913	1.884	4.455	3.888	0.883	0.861	0.778	0.861	0.	0.886	0.852	0.852	0.847					
4602.7	5.938	5.288	3.214	1.164	4.864	0.126	1.181	0.865	0.779	0.784	0.	0.878	0.888	0.888	0.854					
4603.8	6.129	5.459	3.365	1.247	0.179	0.399	0.886	0.698	0.811	0.747	0.	0.898	0.874	0.874	0.861					
4605.8	6.334	5.848	3.583	1.364	0.551	0.798	1.884	0.873	0.848	0.888	0.	0.886	0.889	0.889	0.878					
4610.9	6.563	6.594	3.836	1.554	0.953	0.188	1.488	0.903	0.856	0.898	0.	0.188	0.184	0.184	0.861					
4607.3	6.263	6.361	3.646	1.870	4.331	9.474	1.987	0.788	0.868	0.686	0.	0.188	0.188	0.188	0.184					
4608.9	6.863	7.459	3.937	1.829	4.781	9.888	1.888	0.818	1.815	0.899	0.	0.188	0.712	0.712	0.116					
4609.7	6.854	7.978	4.293	1.887	7.287	9.266	1.763	0.868	1.877	1.883	0.	0.168	0.188	0.188	0.189					
4610.7	6.495	8.452	4.583	2.176	7.831	9.669	1.868	0.918	1.187	1.381	0.	0.184	0.168	0.168	0.161					
4611.8	6.324	8.958	4.958	2.247	8.884	7.848	2.816	0.962	1.184	1.184	0.	0.168	0.186	0.186	0.198					
4612.8	6.139	9.428	5.182	2.488	8.621	7.978	2.138	0.816	1.248	1.281	0.	0.816	0.288	0.288	0.198					
4614.8	6.436	10.078	5.552	2.626	8.811	7.888	2.861	0.878	1.388	1.971	0.	0.848	0.287	0.287	0.888					
4616.2	7.474	10.888	5.882	2.784	9.446	8.867	2.416	0.128	1.368	1.886	0.	0.861	0.868	0.868	0.898					
4616.7	8.891	11.848	6.158	2.848	9.785	8.778	2.843	0.178	1.488	1.486	0.	0.878	0.861	0.861	0.888					
4617.1	9.246	11.447	6.378	3.144	10.417	8.177	2.981	9.286	1.988	1.481	0.	0.889	0.868	0.868	0.287					
4616.1	28.875	12.164	6.468	3.331	10.884	4.928	2.898	0.888	1.914	1.996	0.	0.821	0.891	0.891	0.818					
4618.1	28.986	12.781	7.213	3.521	11.322	10.848	2.691	9.844	1.638	1.688	0.	0.838	0.818	0.818	0.838					
4618.1	29.718	13.168	7.538	3.728	11.686	10.446	2.898	9.468	1.788	1.788	0.	0.868	0.868	0.868	0.868					
4621.1	30.548	13.451	7.878	3.892	12.186	10.886	3.418	9.447	1.778	1.788	0.	0.888	0.848	0.848	0.848					
4622.1	29.388	14.158	8.141	4.141	12.634	11.478	8.448	9.882	1.848	1.867	0.	0.813	0.883	0.883	0.416					
4623.8	28.158	15.186	8.717	4.344	13.432	11.928	8.887	9.886	1.918	1.848	0.	0.488	0.486	0.486	0.449					
4624.8	25.888	15.724	8.917	4.546	13.478	12.481	8.883	8.868	1.868	2.886	0.	0.466	0.426	0.426	0.471					
4624.8	24.781	16.583	9.485	4.773	14.476	12.868	8.881	8.897	1.846	2.187	0.	0.486	0.458	0.458	0.868					
4625.9	24.548	16.875	9.853	4.888	14.977	13.278	4.168	8.868	2.116	2.256	0.	0.912	0.477	0.477	0.819					
4626.7	27.348	17.444	10.227	5.144	15.479	13.688	4.888	8.889	2.189	2.878	0.	0.986	0.884	0.884	0.844					
4627.8	28.138	18.182	10.682	5.385	15.963	19.318	9.486	8.888	2.862	2.885	4.	0.983	0.988	0.988	0.976					
4629.5	29.913	18.884	10.973	5.661	16.468	14.788	9.688	8.863	2.836	2.888	0.	0.986	0.958	0.958	0.881					
4630.4	30.482	19.178	11.938	8.867	16.894	18.248	4.818	8.888	2.462	2.812	0.	0.886	0.978	0.978	0.838					
4618.3	31.444	19.746	11.687	6.888	17.488	15.486	4.966	8.117	2.487	2.878	0.	0.876	0.968	0.968	0.888					
4631.1	31.141	20.258	12.877	6.181	17.817	16.898	8.688	8.178	2.883	8.844	0.	0.966	0.818	0.818	0.888					
4632.8	33.482	20.886	12.948	8.378	18.388	16.838	5.848	8.888	2.988	2.728	0.	0.867	0.838	0.838	0.718					
4632.6	33.556	21.298	12.487	8.574	18.781	16.818	8.374	8.876	2.886	2.775	0.	0.888	0.891	0.891	0.788					
4633.6	33.282	21.781	12.812	6.875	19.183	17.888	5.898	8.888	8.888	2.841	0.	0.784	0.867	0.867	0.761					
4634.4	33.826	22.127	13.166	6.812	14.544	17.886	5.881	8.878	8.781	8.891	0.	0.888	0.888	0.888	0.778					
4618.2	34.427	22.514	13.384	6.836	14.988	17.836	8.867	8.818	8.778	8.949	0.	0.788	0.847	0.847	0.767					
4634.8	34.984	22.878	13.687	7.848	28.283	18.838	9.748	8.951	2.888	8.986	0.	0.748	0.718	0.718	0.814					
4612.6	35.587	23.344	13.788	7.138	28.481	18.478	8.857	2.489	2.838	8.888	0.	0.788	0.788	0.788	0.817					
4617.9	35.468	23.448	13.828	7.287	28.898	16.881	8.916	2.818	2.886	8.886	0.	0.778	0.726	0.726	0.827					
4618.1	36.384	23.874	14.858	7.314	29.888	18.888	8.994	2.838	2.876	8.884	0.	0.781	0.884	0.884	0.836					
4616.5	36.768	23.818	14.141	7.317	21.384	19.888	9.198	2.889	2.891	8.178	0.	0.787	0.736	0.736	0.844					

Table 7-1 $\left[\int_0^\infty (1-T)dy\right]$ (continued)

Table 7-1 $\left[\int_0^\infty (1-T)\,d\nu\right]$ (continued)

Sam. Sh.	a	b	c	d	e	f	g	aa	ab	ac	ad	ae	af	ag	ah	ai	aj	ak	al
p(atm)	7.03 $\times 10^{-3}$	7.03 $\times 10^{-3}$	3.17 $\times 10^{-1}$	2.77 $\times 10^{-1}$	3.17 $\times 10^{-1}$	8.25 $\times 10^{-2}$	4.55 $\times 10^{-2}$	4.55 $\times 10^{-2}$	8.59 $\times 10^{-2}$	8.35 $\times 10^{-3}$	6.35 $\times 10^{-2}$	6.21 $\times 10^{-2}$	3.28 $\times 10^{-2}$	1.32 $\times 10^{-1}$	4.12 $\times 10^{-3}$	4.12 $\times 10^{-3}$	4.12 $\times 10^{-3}$	4.12 $\times 10^{-3}$	4.12 $\times 10^{-3}$	8.1 $\times 10^{-4}$
p_c(atm)	8.82 $\times 10^{-2}$	2.95 $\times 10^{-2}$	2.82 $\times 10^{-1}$	1.400 $\times 10^{0}$	9.07 $\times 10^{0}$	1.01 $\times 10^{-2}$	3.00 $\times 10^{-1}$	1.1C $\times 10^{1}$	2.09 $\times 10^{0}$	1.002 $\times 10^{1}$	9.00 $\times 10^{-1}$	3.02 $\times 10^{0}$	1.001 $\times 10^{1}$	1.00C $\times 10^{1}$	1.41 $\times 10^{-1}$	8.07 $\times 10^{-1}$	1.001 $\times 10^{0}$	3.00 $\times 10^{0}$	1.000 $\times 10^{1}$
u(atm cm) STP	3.29 $\times 10^{2}$	3.29 $\times 10^{2}$	3.30 $\times 10^{2}$	3.30 $\times 10^{2}$	3.30 $\times 10^{2}$	9.96 $\times 10^{1}$	8.96 $\times 10^{1}$	8.9L $\times 10^{1}$	8.96 $\times 10^{1}$	9.96 $\times 10^{1}$	2.96 $\times 10^{1}$	2.96 $\times 10^{1}$	2.90 $\times 10^{1}$	5.03 $\times 10^{1}$	6.36 $\times 10^{0}$	8.86 $\times 10^{0}$	6.36 $\times 10^{0}$	6.36 $\times 10^{0}$	6.36 $\times 10^{0}$
ν (cm^{-1})	ν_{4751} cm^{-1}	ν_{4753} cm^{-1}	ν_{4755} cm^{-1}	ν_{4757} cm^{-1}	ν_{4759} cm^{-1}	ν_{4761} cm^{-1}	ν_{4763} cm^{-1}	ν_{4765} cm^{-1}	ν_{4767} cm^{-1}	ν_{4769} cm^{-1}	$\nu_{4808.4}$ cm^{-1}	$\nu_{4808.4}$ cm^{-1}	$\nu_{4808.4}$ cm^{-1}	$\nu_{4808.4}$ cm^{-1}	ν_{4811} cm^{-1}	ν_{4811} cm^{-1}	ν_{4811} cm^{-1}	ν_{4811} cm^{-1}	ν_{4811} cm^{-1}
4640.8																			
4641.4																			
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4748.2																			
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4749.4																			
4750.0																			
4750.6																			
4751.2	0./	0.	0.	0.	0.	0./	0.	0.	0.	0.									
4751.8	0.0898	0.011	0.001	0.004	0.007	0.	0.	0.	0.	0.									
4752.5	0.0818	0.023	0.002	0.006	0.015	0.	0.	0.	0.	0.									
4753.1	0.0818	0.030	0.007	0.013	0.025	0.	0.	0.	0.	0.									
4753.7	0.0820	0.051	0.010	0.010	0.015	0.	0.	0.	0.	0.									
4754.3																			
4754.9																			
4755.5																			
4756.1																			
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4757.3																			
4757.9																			
4758.5																			
4759.1																			
4759.7																			
4760.3																			
4760.8	0.030	0.004	0.011	0.020	4.044	0./	0.	0.	0.	0.									
4761.4	0.049	0.078	0.017	0.035	0.095	0.	0.	0.	0.	0.									
4762.0	0.059	0.091	0.021	0.043	0.108	0.004	0.000	0.000	0.000	0.078									
4762.6	0.068	0.100	0.000	0.052	0.095	0.001	0.005	0.000	0.001	0.101									
4763.2	0.070	0.125	0.024	0.003	0.095	0.007	0.010	0.010	0.002	0.102									
4763.8																			
4764.4																			
4765.0																			
4765.6																			
4766.2																			
4766.8	0.097	0.141	0.042	0.077	0.113	0.004	0.020	0.017	0.007	0.084									
4767.4	0.103	0.141	0.040	0.098	0.105	0.007	0.027	0.002	0.012	0.088									
4768.0	0.110	0.144	0.046	0.105	0.142	0.011	0.025	0.029	0.010	0.089									
4768.6	0.130	0.208	0.077	0.172	0.108	0.015	0.049	0.036	0.029	0.010									
4769.2	0.102	0.229	0.081	0.125	0.177	0.010	0.052	0.040	0.020	0.017									

Table 7-1 $\left[\int_0^\infty (1-T)d\nu\right]$ (continued)

Sam. Dr.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
p(atm)	2.38 x 10^0	0.53 x 10^0	2.51 x 10^0	1.38 x 10^0	7.00 x 10^0	1.000 x 10^0	1.000 x 10^0	1.16 x 10^{-1}	2.50 x 10^{-1}	2.30 x 10^{-1}	1.47 x 10^{-2}	7.70 x 10^{-2}	7.70 x 10^{-1}	7.70 x 10^{-1}	1.18 x 10^{-2}	1.35 x 10^{-1}	2.36 x 10^{-1}	1.34 x 10^{-2}	4.67 x 10^{-1}
P_o(atm)	3.26 x 10^0	3.32 x 10^0	1.32 x 10^0	3.29 x 10^0	7.42 x 10^0	1.11 x 10^0	1.31 x 10^0	1.38 x 10^{-1}	3.80 x 10^{-1}	6.99 x 10^{-1}	1.01 x 10^{-2}	1.001 x 10^{-1}	1.01 x 10^{-1}	1.001 x 10^0	1.18 x 10^{-2}	1.04 x 10^{-1}	1.01 x 10^{-1}	3.00 x 10^{-1}	6.70 x 10^{-1}
x(atm cm) x10^3	2.17 x 10^1	1.11 x 10^1	1.57 x 10^1	2.01 x 10^1	4.71 x 10^1	0.01 x 10^1	2.12 x 10^1	0.94 x 10^1	2.50 x 10^1	6.31 x 10^1	1.31 x 10^1	3.12 x 10^1	3.12 x 10^1	3.31 x 10^1	1.01 x 10^1	1.01 x 10^1	1.01 x 10^1	1.01 x 10^1	1.01 x 10^1

ν (cm^{-1})	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4536 cm^{-1}	ν-4579.3 cm^{-1}	ν-4579.3 cm^{-1}	ν-4579.3 cm^{-1}	ν-4579.3 cm^{-1}	ν-4706 cm^{-1}	ν-4706 cm^{-1}	ν-4706 cm^{-1}	ν-4706 cm^{-1}	ν-4706 cm^{-1}
4746.1	176.455	90.456	47.644	48.881	87.551	81.444	33.868	10.819	20.047	18.823	3.516	6.667	9.789	8.838	1.2894	0.888	1.320	1.564	1.385
4747.1	177.455	87.456	44.657	43.156	88.542	81.438	34.849	14.888	18.886	19.276	3.338	6.883	9.871	8.898	1.2188	0.888	1.588	1.978	1.884
4748.1	178.455	88.456	44.659	44.871	89.514	81.432	35.880	19.888	19.918	19.981	3.788	6.876	9.919	9.892	1.2188	1.027	1.447	1.751	1.488
4749.2	179.455	89.456	38.657	44.952	88.581	84.411	38.194	18.511	17.888	20.488	3.548	6.888	9.819	8.897	1.2778	1.077	1.926	1.888	1.551
4778.2	180.455	136.456	71.745	49.887	81.515	99.436	88.885	19.844	17.887	21.891	4.188	8.878	9.811	9.788	1.2788	1.157	1.829	1.818	1.474
4771.1	181.455	181.454	77.779	48.772	98.583	86.481	37.787	18.154	18.329	21.841	4.238	8.817	9.788	7.438	1.2338	1.185	4.987	1.881	1.786
4772.1	134.457	142.454	73.773	47.771	91.484	87.487	38.953	19.875	18.788	22.218	4.488	8.588	1.888	7.772	1.2485	0.267	8.147	8.186	1.873
4778.6	135.454	153.458	74.773	48.844	94.488	88.488	38.568	18.948	18.188	22.795	4.588	8.741	1.288	8.844	1.2485	1.329	8.888	8.841	1.854
4714.8	136.455	144.458	78.773	48.841	95.426	89.488	48.518	19.517	19.387	23.519	4.748	8.884	1.838	8.487	1.2538	1.412	1.877	7.343	8.115
4775.9	137.455	145.458	78.773	48.841	88.584	98.488	41.388	19.888	20.318	24.147	4.888	7.178	7.878	8.718	1.2988	1.474	8.859	7.441	8.217
4776.8	138.455	136.458	77.773	51.883	87.484	91.488	42.288	18.817	20.838	24.881	4.188	7.443	8.281	8.158	1.4878	1.671	9.188	8.888	7.188
4777.1	139.458	147.458	76.773	47.843	94.484	92.488	48.178	18.895	21.885	25.837	9.878	7.893	8.488	8.443	1.4788	1.831	8.875	8.714	8.489
4778.8	148.455	148.449	78.773	43.554	89.484	91.488	44.888	19.178	21.858	26.888	9.488	7.878	8.888	8.987	1.4978	1.728	8.413	8.878	8.788
4779.8	149.455	149.454	44.773	54.554	158.484	94.488	54.988	18.819	23.438	27.888	9.888	8.116	8.888	18.288	1.4827	1.888	8.888	8.971	8.853
4748.8	143.455	148.458	41.771	49.884	181.484	99.488	48.888	28.185	23.984	27.885	9.888	8.884	8.448	18.788	1.4478	1.983	2.888	8.177	8.887
741.8	141.455	111.458	84.771	51.875	183.484	94.488	38.818	28.888	28.878	28.445	4.188	8.868	8.884	11.188	1.3188	1.884	8.788	8.879	3.888
4742.8	144.455	112.458	58.771	47.842	183.484	97.488	47.728	28.888	24.118	28.118	8.788	8.887	18.148	11.558	1.3178	2.885	3.888	8.884	8.488
4743.8	144.454	113.458	44.773	48.844	134.484	98.488	48.887	28.889	24.758	28.888	8.817	9.181	18.158	18.158	1.3214	8.117	8.848	8.739	8.488
4744.8	145.454	114.458	45.773	48.818	185.484	99.488	48.823	28.888	28.263	28.847	8.888	8.277	18.818	18.484	1.3788	2.287	8.181	3.846	8.851
4745.8	147.455	115.458	46.774	48.824	136.484	458	58.598	23.885	25.811	31.516	8.871	8.738	18.818	13.114	1.3884	8.147	4.118	4.179
4746.8	144.455	116.458	87.771	41.874	137.484	111.488	51.948	63.138	24.583	83.843	7.158	8.843	11.818	13.518	1.3458	2.431	3.444	4.241	4.846
4747.8	148.455	117.458	46.773	47.878	188.484	188.488	58.888	88.729	27.283	88.181	7.485	13.898	18.885	14.128	1.3558	2.857	4.838	4.888	4.481
4748.8	154.455	118.458	48.773	43.874	188.484	188.488	58.478	84.258	27.868	88.888	7.838	18.872	18.478	14.878	1.3428	2.825	8.755	4.871	4.884
4748.8	151.455	119.458	48.773	44.878	118.484	184.488	54.488	84.898	28.818	84.788	7.851	14.838	18.838	15.141	1.3778	8.788	8.817	4.888	5.188
4748.8	152.455	128.458	49.773	45.574	111.484	185.488	55.412	89.888	28.268	88.581	8.888	11.187	13.388	15.828	1.3788	8.818	4.883	5.896	5.418
4748.8	147.455	121.458	87.778	41.878	118.484	188.488	58.888	88.818	28.788	38.183	8.788	11.885	13.878	8.884	4.187	8.278	5.781
4748.8	144.454	122.458	83.773	47.838	113.484	187.488	57.888	88.488	18.818	37.748	8.818	11.444	14.874	18.854	8.888	4.888	8.948	5.884
4748.8	148.455	123.458	84.771	48.835	114.484	188.488	58.888	88.948	31.178	38.133	8.788	18.883	14.488	17.455	1.3885	8.874	4.484	4.718	4.288
4748.8	178.455	124.458	85.771	48.887	115.484	188.488	58.888	88.888	31.888	38.888	8.888	18.888	14.887	18.118	1.3788	8.888	4.888	8.998	4.818
4748.8	147.455	125.458	84.773	48.824	118.488	88.892	88.138	32.881	34.948	8.948	12.847	15.388	18.788	3.215	1.3888	4.881	8.218	4.878
4788.8	158.455	126.458	87.771	51.828	117.484	111.488	81.278	88.783	18.888	48.787	8.478	12.836	15.888	18.388	3.318	3.385	9.887	8.451	7.388
4787.8	158.455	122.458	88.771	52.828	114.484	112.488	82.271	28.321	14.858	41.858	8.738	18.885	14.812	18.851	3.485	3.888	9.188	8.788	7.588
4748.8	168.455	28.458	88.771	52.828	115.488	113.488	88.888	28.888	15.888	42.758	8.888	18.814	14.782	18.878	3.488	4.871	8.817	8.847	7.847
4788.8	141.455	28.458	148.771	74.878	126.484	114.488	84.288	88.887	35.961	43.488	18.778	18.815	17.888	21.378	3.881	8.748	8.848	7.317	8.187
4838.8	142.454	148.454	144.771	78.828	121.488	115.488	88.298	88.218	38.888	44.418	18.538	14.315	17.748	22.887	1.783	8.887	8.752	7.478	8.487
4881.8	138.455	141.458	142.773	76.826	107.484	118.488	88.281	88.148	18.888	45.388	18.718	14.881	18.188	23.838	3.788	8.858	8.885	7.888	8.287
4882.8	144.454	152.454	141.771	77.828	133.484	117.488	87.244	38.888	17.758	48.328	11.344	14.973	18.888	23.887	8.887	4.887	8.189	7.858	8.117
4883.1	145.457	153.458	144.773	78.828	134.484	118.488	88.232	88.878	38.481	47.137	11.783	18.888	18.118	23.888	3.488	4.185	8.888	8.178	8.388
4884.8	146.455	154.458	144.771	78.828	125.484	118.488	88.818	11.588	36.182	48.887	11.541	18.918	18.878	24.538	51881	4.318	8.478	8.[illegible]	8.484
4885.8	147.455	155.458	184.771	48.828	128.484	128.488	78.285	85.147	38.878	48.573	11.772	18.913	18.987	28.847	4.178	4.518	8.888	8.851	8.411
4888.8	148.455	158.454	187.771	42.828	127.484	181.488	71.576	34.788	48.954	48.718	18.818	88.418	35.878	4.268	4.538	8.785	8.844	18.184	
4887.8	148.455	157.458	188.773	48.828	128.488	128.488	72.118	85.188	41.878	88.431	18.188	18.445	48.811	35.838	4.317	8.884	8.884	8.878	18.334
4888.8	178.455	158.454	188.773	43.828	128.488	128.488	78.884	35.788	41.748	51.283	18.588	18.837	38.188	38.888	4.488	4.884	5.127	5.834	18.838
4888.8	171.455	158.458	118.773	44.828	128.484	124.488	73.975	88.188	42.268	51.388	18.878	17.851	38.858	38.888	4.588	4.818	7.318	4.338	18.731
4818.8	177.455	148.458	111.773	45.878	181.484	129.488	74.988	88.788	48.888	52.788	18.838	17.341	38.988	37.488	4.8338	4.818	7.388	8.588	11.885
4871.8	173.455	141.458	118.773	44.828	132.484	128.488	78.995	87.381	48.884	53.872	13.181	17.886	33.888	38.848	4.718	8.838	7.848	8.781	11.258
4813.8	174.455	142.458	118.773	47.828	181.484	127.488	78.948	88.818	44.178	54.418	13.488	18.877	38.878	38.788	4.888	8.178	7.788	18.124	11.445
4813.8	175.455	143.458	118.773	48.828	138.484	128.488	77.941	88.818	45.888	55.888	13.728	18.181	38.887	38.888	4.888	8.288	8.888	18.248	11.831
4814.8	176.455	144.458	118.773	48.828	135.484	129.488	78.588	89.888	48.844	58.478	14.881	18.885	38.888	38.815	5.888	8.848	8.882	18.758	12.483
4815.8	177.455	145.458	114.773	48.828	138.488	138.488	78.884	88.887	48.881	57.888	14.878	18.243	34.818	38.814	5.158	8.982	8.434	11.828	18.788
4818.8	174.455	146.458	114.773	81.828	117.484	131.488	88.884	48.738	47.858	58.875	14.738	18.484	88.188	31.778	5.888	8.881	8.818	11.478	13.818
4817.8	178.455	147.458	118.773	48.774	118.484	138.488	81.885	48.427	48.887	58.783	15.818	28.878	85.788	38.881	5.588	8.847	8.888	11.748	13.746
4818.8	184.455	148.458	118.773	83.828	118.484	133.488	82.914	83.817	48.888	88.888	18.488	28.581	88.877	38.438	5.518	8.888	8.838	12.281	14.848
4818.8	181.455	148.458	128.773	44.828	148.484	134.488	88.815	48.884	88.178	81.887	18.888	88.888	28.874	34.251	8.818	8.188	8.841	12.477	14.788
4838.8	149.455	158.458	121.773	88.828	141.484	139.488	84.885	47.888	58.883	88.888	19.848	81.888	87.888	38.848	8.758	8.388	8.844	18.818	15.833
4871.8	143.455	151.458	128.778	48.828	142.484	136.488	88.885	88.847	51.871	88.318	18.887	81.828	28.281	38.888	8.888	8.484	18.887	13.385	15.877
4873.8	184.455	152.458	123.773	87.822	148.484	137.488	84.884	48.888	52.758	84.818	18.788	28.884	88.818	38.838	8.2188	8.838	18.838	13.788	18.477
4878.8	185.455	153.458	124.773	88.828	144.484	138.488	87.854	48.887	52.881	85.281	17.168	28.827	38.844	37.783	8.178	8.883	18.887	14.183	17.181
4874.8	148.455	154.458	125.773	78.828	145.484	139.488	88.888	48.843	54.827	88.187	17.128	23.898	88.218	38.588	8.2281	8.888	18.884	14.587	17.478
4878.8	187.454	155.458	126.773	148.828	148.488	148.488	88.834	47.888	58.885	87.188	17.888	83.788	38.814	38.488	8.488	8.188	18.884	15.884	18.888
4878.8	148.455	156.458	187.773	141.828	147.484	141.488	88.834	48.824	58.185	88.188	18.148	84.878	38.447	48.288	8.488	8.882	18.378	15.338	18.888
4877.8	188.455	187.458	188.778	148.828	148.484	143.488	81.834	48.888	57.148	88.188	18.488	84.878	88.888	41.888	8.8888	8.884	11.388	15.885	8.481
4878.8	148.455	158.458	128.778	148.828	148.484	143.488	83.824	48.818	58.818	78.111	18.888	85.858	88.828	48.118	8.2388	8.888	11.888	18.287	8.481
4878.8	148.455	158.458	128.773	148.828	148.484	144.488	88.824	48.888	58.888	78.188	18.888	85.878	88.888	48.888	8.2388	8.878	18.881	18.812	18.885
4818.8	147.455	188.458	178.773	148.828	181.484	145.488	88.838	84.148	88.887	78.885	18.888	88.888	88.888	47.888	8.2888	8.878	18.878	17.118	8.173
4812.8	195.258	193.258	184.573	148.274	194.284	148.888	88.834	88.878	88.883	74.883	28.988	87.588	28.228	48.988	8.488	8.882	18.848	18.848	28.118
4814.8	197.488	185.488	138.373	118.828	194.884	88.888	88.888	88.188	88.888	81.878	28.888	88.837	87.888	48.847	8.7258	8.888	18.117	18.387	24.881
4878.4	198.488	184.488	138.173	118.828	181.888	181.888	181.334	88.888	88.888	78.481	88.418	88.488	18.883	48.888	7.881	8.8888	8.888	18.2388	28.884
4818.1	288.888	148.888	188.873	113.828	189.884	188.888	188.874	88.888	87.878	88.181	88.178	88.447	48.218	51.878	8.2248	8.874	18.251	21.882	28.788
4818.8	282.888	171.258	148.578	118.228	181.384	188.288	188.288	88.888	88.158	81.881	28.828	88.317	48.874	88.187	8.1488	8.858	18.838	21.887	27.988
4841.8	283.888	171.888	148.273	178.588	188.884	158.888	188.434	88.838	88.888	83.881	84.878	88.271	88.888	88.134	8.1888	18.888	28.888	88.138	
4841.1	285.555	178.558	144.573	118.825	184.884	458.588	188.884	88.888	82.315	85.181	25.218	38.182	48.118	58.381	8.1817	18.878	18.788	88.458	38.875
4845.8	317.788	175.252	148.573	178.878	188.284	188.288	188.774	83.878	73.888	88.881	25.888	88.888	48.888	57.887	8.188	18.887	17.388	84.254	31.484
4848.4	278.888	178.888	148.173	171.828	187.884	181.888	115.384	88.288	88.478	88.481	88.888	88.888	48.887	58.888	8.1888	18.857	17.782	74.878	38.988
4848.8	278.488	178.488	148.778	178.488	188.488	868.488	112.884	88.888	73.888	88.881	87.188	88.888	48.738	81.828	8.1888	18.888	88.884	88.884	38.877
4848.8	712.888	188.888	188.378	188.878	181.884	188.188	118.888	88.888	88.888	81.887	27.788	38.888	48.884	87.888	8.1788	18.888	18.887	28.388	34.881
4851.2	213.888	141.888	188.878	178.828	172.884	188.888	118.184	88.888	88.888	88.888	28.888	88.888	48.748	88.828	8.1888	18.888	18.878	28.848	38.987
4858.8	218.888	148.888	188.573	178.128	178.884	188.888	118.388	88.348	81.958	88.818	28.1138	88.888	48.788	88.388	18.881	11.888	18.848	27.818	38.488
4858.2	217.888	188.888	188.478	178.188	178.884	178.884	178.388	88.888	82.778	88.881	28.8888	88.888	48.888	88.888	18.881	11.888	18.881	27.888	31.888
4858.7	214.188	187.158	188.478	178.188	172.8188	871.818	178.888	88.888	88.881	88.887	28.888	88.888	48.888	87.758	18.388	18.328	88.818	88.818	37.888
4858.2	228.888	188.858	188.478	182.838	178.884	178.888	188.318	88.888	88.888	88.888	88.828	88.821	88.888	88.148	18.488	18.888	28.883	88.874	38.788
4858.7	227.188	188.158	188.578	185.178	181.188	178.188	184.818	74.888	88.888	181.828	28.888	88.278	88.818	78.871	18.881	18.888	88.888	88.758	89.142
4845.2	223.888	181.858	188.173	188.878	178.884	178.888	188.888	78.888	88.888	181.818	28.888	88.888	88.888	78.888	18.858	18.888	21.888	88.827	41.888
4862.8	228.888	183.888	184.878	188.884	184.884	178.888	187.818	77.888	88.888	188.888	28.888	88.888	88.888	88.888	18.188	18.818	81.888	81.888	42.818
4864.8	226.888	184.888	188.888	178.888	178.888	178.888	188.818	78.888	88.178	188.718	28.888	88.888	88.888	88.888	18.878	18.888	81.888	88.888	43.888
4848.8	227.888	185.888	188.888	148.828	186.884	188.888	188.818	88.878	88.888	188.118	88.388	88.888	88.888	88.888	18.888	18.888	88.887	88.818	44.188
4846.8	228.388	187.388	188.873	142.828	188.384	188.328	181.818	88.878	88.888	188.818	88.888	88.888	88.888	88.888	18.888	18.888	88.888	88.888	45.578
4848.8	228.888	188.788	178.878	148.728	188.788	188.888	188.888	88.787	88.888	188.818	88.888	88.888	88.888	88.888	18.888	18.888	88.888	88.888	46.317
4849.7	218.188	188.158	178.478	148.128	188.188	188.888	188.888	88.888	88.888	188.818	88.888	88.888	88.888	88.888	18.888	18.888	88.888	88.888	47.788
4851.1	218.888	188.888	172.873	148.878	187.884	188.888	188.818	88.888	88.888	188.888	88.888	88.888	88.888	88.888	18.888	18.888	88.888	88.888	48.888

Table 7-1 $\left[\int_0^{\infty}(1-T)\,d\nu\right]$ (continued)

Sam. No.	t	s	T	u	v	y	z	aa	ab	ac	ad	ae	af	ag	ah	ai	aj	ak	al
$p(atm)$	7.63 $\times 10^{-1}$	7.63 $\times 10^{-3}$	2.17 $\times 10^{-1}$	2.17 $\times 10^{-1}$	2.17 $\times 10^{-1}$	8.31 $\times 10^{-2}$	8.31 $\times 10^{-2}$	8.31 $\times 10^{-2}$	8.31 $\times 10^{-2}$	8.39 $\times 10^{-2}$	6.35 $\times 10^{-6}$	9.11 $\times 10^{-2}$	3.24 $\times 10^{-2}$	1.32 $\times 10^{-1}$	9.12 $\times 10^{-3}$	6.32 $\times 10^{-3}$	6.12 $\times 10^{-3}$	9.12 $\times 10^{-3}$	6.17 $\times 10^{-3}$
$P_0(atm)$	0.52 $\times 10^{-3}$	2.99 $\times 10^{-2}$	2.25 $\times 10^{0}$	1.000 $\times 10^{0}$	3.9[illegible] $\times 10^{0}$	8.31 $\times 10^{-2}$	9.00 $\times 10^{-1}$	1.0[illegible] $\times 10^{0}$	3.02 $\times 10^{0}$	1.002 $\times 10^{0}$	1.002 $\times 10^{0}$	2.00 $\times 10^{-1}$	3.02 $\times 10^{0}$	1.001 $\times 10^{0}$	1.001 $\times 10^{0}$	5.41 $\times 10^{-2}$	2.87 $\times 10^{-1}$	1.001 $\times 10^{0}$	1.000 $\times 10^{0}$
$d(atm\ cm)$ STP	3.26 $\times 10^{2}$	3.29 $\times 10^{2}$	2.30 $\times 10^{2}$	1.30 $\times 10^{2}$	3.30 $\times 10^{2}$	9.96 $\times 10^{1}$	9.96 $\times 10^{1}$	9.96 $\times 10^{1}$	9.96 $\times 10^{1}$	9.96 $\times 10^{1}$	1.56 $\times 10^{3}$	7.36 $\times 10^{1}$	9.30 $\times 10^{1}$	9.03 $\times 10^{1}$	9.30 $\times 10^{1}$	6.26 $\times 10^{0}$	9.-1 $\times 10^{-}$	9.26 $\times 10^{0}$	6.26 $\times 10^{0}$

ν (cm^{-1})	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4751}$ cm^{-1}	$\int_{\nu}^{4808.4}$ cm^{-1}	$\int_{\nu}^{4808.4}$ cm^{-1}	$\int_{\nu}^{4808.4}$ cm^{-1}	$\int_{\nu}^{4808.4}$ cm^{-1}	$\int_{\nu}^{4811}$ cm^{-1}	$\int_{\nu}^{4811}$ cm^{-1}	$\int_{\nu}^{4811}$ cm^{-1}	$\int_{\nu}^{4811}$ cm^{-1}	$\int_{\nu}^{4811}$ cm^{-1}
4766.0	0.198	0.844	0.198	0.198	0.198	0.0022	0.068	0.951	0.038	0.022									
4767.0	0.178	0.852	0.151	0.169	0.217	0.007	0.070	0.957	0.029	0.020									
4768.0	0.140	0.380	0.238	0.195	0.744	0.036	0.082	0.960	0.045	0.304									
4769.0	0.214	0.811	0.147	0.215	3.967	0.041	0.092	0.970	0.095	0.041									
4770.0	0.242	0.346	0.277	0.247	0.299	5.056	0.167	0.980	0.062	0.048									
4771.0	0.287	0.867	0.887	0.869	0.922	0.093	2.11	0.980	0.066	0.066									
4772.0	0.285	0.685	0.232	0.383	0.894	0.062	0.232	0.268	0.077	0.084									
4773.0	0.286	0.626	0.840	0.808	0.380	0.867	0.141	0.108	0.085	0.174									
4774.0	0.246	0.671	0.868	0.388	0.435	0.070	0.156	0.112	0.090	0.106									
4775.0	0.208	0.699	0.887	0.423	0.479	0.081	0.162	0.123	0.199	0.099									
4776.0	0.483	0.958	0.256	0.473	0.938	4.194	0.162	5.141	0.124	0.112									
4777.0	0.437	0.577	0.688	0.924	0.970	0.101	0.208	0.192	0.185	0.127									
4778.0	0.467	0.685	0.444	0.906	0.662	0.118	0.238	0.172	0.154	0.144									
4779.0	0.966	0.868	0.468	0.657	0.762	0.128	0.266	0.100	0.147	0.168									
4780.0	0.948	0.728	0.663	0.782	0.771	0.147	0.279	0.085	0.189	0.176									
4781.0	0.598	0.784	0.887	0.776	0.867	0.164	0.267	1.829	0.782	0.152									
4782.0	0.918	0.815	0.895	0.861	0.917	0.181	0.913	0.844	0.921	0.021									
4783.0	0.968	0.871	0.142	0.944	1.215	0.207	0.266	0.872	0.847	0.048									
4784.0	0.468	0.938	0.781	0.896	1.884	0.217	0.981	0.847	0.249	0.277									
4785.0	0.744	0.988	0.884	1.117	1.143	0.248	0.389	0.716	6.948	0.381									
4786.0	0.778	2.813	0.695	1.184	1.274	0.868	0.418	0.842	0.817	0.338									
4787.0	0.819	1.884	0.833	1.298	1.387	0.292	0.446	0.872	0.349	0.362									
4788.0	0.859	2.717	0.882	1.254	1.483	0.213	0.488	0.899	0.876	0.365									
4789.0	0.468	1.191	1.886	1.467	1.962	0.337	0.984	6.629	0.447	0.431									
4790.0	0.928	1.224	1.877	1.998	1.788	0.266	0.842	0.961	0.448	0.467									
4791.0	0.994	1.861	1.842	1.667	1.818	0.289	0.962	6.988	0.476	0.488									
4792.0	0.969	1.838	1.496	1.821	1.445	0.418	6.681	0.824	0.911	0.487									
4793.0	1.018	2.894	0.627	1.912	2.894	0.448	2.824	0.852	0.941	0.877									
4794.0	1.897	1.481	1.842	2.888	2.193	0.476	0.667	6.988	0.502	0.411									
4795.0	1.188	1.914	1.886	2.188	2.521	0.595	0.866	0.829	1.878	0.681									
4796.0	1.182	1.984	1.936	2.866	2.488	0.536	0.738	0.894	0.858	0.681									
4797.0	1.152	1.845	1.898	2.422	2.884	0.871	6.772	0.898	0.488	0.751									
4798.0	1.234	1.71	2.847	2.841	2.728	0.181	0.888	0.787	0.728	1.778									
4799.0	1.284	1.781	2.188	2.888	2.888	0.836	0.841	0.842	0.757	4.615									
4800.0	1.295	2.891	2.865	2.788	2.898	0.864	0.874	0.784	0.883	0.857									
4801.0	1.267	1.817	2.861	2.886	3.128	7.866	0.788	0.874	0.838	0.886									
4802.0	1.485	1.841	2.488	3.888	8.249	0.789	2.848	0.857	0.872	0.8[illegible]									
4803.0	1.473	2.845	8.882	3.187	8.258	1.782	0.888	0.882	0.838	0.[illegible]									
4[illegible]	1.929	2.124	2.848	2.257	3.488	0.781	0.844	2.838	0.887	0.888									
4[illegible]	1.979	2.178	2.719	3.318	3.944	0.814	1.818	0.821	0.888	1.828									
4806.0	1.828	2.843	8.882	3.483	8.825	0.828	1.838	8.847	0.866	1.882									
4807.0	1.468	2.888	2.829	3.491	3.486	0.838	2.891	0.868	0.882	1.879									
4808.0	1.737	2.871	2.888	3.971	3.812	0.871	2.862	4.888	1.818	1.186									
4809.0	1.788	2.898	2.866	3.818	3.874	0.878	1.891	0.887	1.825	1.128	0.898	0.841	8.582	8.878					
4810.0	1.819	2.867	2.871	3.734	3.849	0.896	1.824	1.824	2.857	1.197	0.882	0.885	8.484	8.876					
4811.0	1.897	3.819	8.138	3.819	4.885	8.928	2.148	1.498	1.885	1.286	8.813	8.888	8.826	8.846					
4812.0	1.928	3.819	8.282	3.881	4.278	1.878	2.182	1.887	1.138	1.268	8.876	8.818	8.811	8.873					
4813.0	1.971	2.868	8.274	4.188	4.411	8.967	2.236	8.148	1.181	1.318	8.838	8.876	8.817	8.131					
4814.0	2.881	2.743	8.887	4.341	4.142	1.878	1.288	1.288	1.278	1.878	8.878	8.868	8.826	8.136					
4815.0	2.188	8.829	8.883	4.981	4.888	1.868	1.387	1.248	1.215	1.487	8.868	8.858	4.84	8.178					
4816.0	2.178	3.843	3.878	4.788	5.188	1.151	1.423	8.341	1.486	1.837	8.886	8.878	4.884	8.218					
4817.0	2.227	3.871	8.882	4.446	5.361	1.187	2.589	1.478	1.488	1.828	8.182	8.868	4.872	8.275					
4818.0	2.384	3.126	4.263	5.274	5.878	1.787	2.881	1.817	1.581	1.728	8.188	8.114	4.883	8.378					
4819.0	2.384	3.281	4.417	5.918	5.963	1.3[illegible]	2.885	1.828	1.885	1.848	8.144	8.134	4.114	8.176					
4820.0	2.438	3.333	4.888	5.786	6.319	1.388	3.768	1.219	1.818	1.864	8.184	8.144	4.148	8.444					
4821.0	2.518	8.426	4.874	6.133	6.788	1.468	1.888	1.868	1.845	8.896	8.288	8.198	8.186	8.914					
4822.0	2.575	3.[illegible]	8.886	6.[illegible]44	7.868	1.521	1.884	1.961	8.874	2.238	8.242	8.238	8.188	8.888					
4823.0	2.647	2.[illegible]15	8.817	6.888	7.494	1.627	8.173	2.127	2.238	2.889	8.274	8.246	8.282	8.648					
4824.0	2.718	8.778	5.[illegible]42	7.114	7.877	1.678	8.184	2.812	8.366	8.555	8.288	8.337	8.278	8.754					
4825.0	2.611	3.848	5.788	7.488	8.368	1.748	2.263	2.[illegible]5	8.888	2.737	8.284	8.358	8.811	8.891					
4826.0	2.854	8.818	8.838	7.734	8.727	1.888	2.421	2.588	2.715	2.817	8.878	8.388	4.885	8.844					
4827.0	2.458	4.[illegible]53	8.852	8.218	8.382	1.818	2.812	2.787	2.854	3.186	8.448	8.444	4.885	1.848					
4828.0	3.887	4.142	8.425	8.491	9.718	1.928	8.881	2.843	3.188	3.338	8.488	8.488	4.885	1.178					
4829.0	2.117	4.288	8.162	8.885	18.317	2.888	2.883	8.885	2.372	3.568	8.588	8.548	4.813	1.298					
4830.0	8.168	4.[illegible]7	8.817	8.288	18.761	2.185	2.883	2.827	3.581	3.748	8.588	8.414	4.871	1.[illegible]1					
4832.0	3.485	4.714	9.118	18.488	17.367	2.362	8.428	8.388	4.267	4.585	8.744	8.818	4.884	1.[illegible]7					
4833.6	3.544	4.828	8.158	11.258	18.487	2.842	8.718	6.882	4.787	8.857	8.881	8.448	4.884	2.114					
4834.4	3.881	9.128	8.484	12.838	18.787	2.888	8.888	6.898	5.811	8.888	8.888	1.838	4.897	2.428					
4835.[illegible]	3.883	8.384	9.129	12.888	19.458	8.838	4.284	4.492	8.841	8.148	1.888	1.895	4.213	2.731					
4839.0	3.924	8.488	9.884	18.967	18.778	2.877	4.888	9.881	1.877	8.741	1.788	1.411	1.873	3.458					
4841.9	4.163	5.884	18.888	14.367	17.811	3.187	6.887	9.888	8.872	7.317	1.887	1.572	1.484	3.178					
4842.1	4.188	8.841	18.482	15.158	18.984	3.278	8.148	6.185	7.768	7.882	8.486	1.724	1.487	2.471					
4844.8	8.284	6.841	18.644	15.827	28.887	3.417	8.486	6.885	7.861	8.198	1.874	1.874	1.828	3.873					
4846.4	4.484	6.886	11.278	18.648	21.882	3.546	9.795	8.847	8.418	8.872	1.878	2.144	1.871	4.254					
4848.8	4.512	8.848	11.788	17.848	22.828	3.878	8.884	7.288	8.818	8.287	1.788	8.118	8.888	4.443					
4849.6	4.619	6.822	12.138	17.961	23.[illegible]	3.784	8.228	7.878	8.147	8.828	1.841	2.187	1.478	4.951					
4851.2	4.787	6.887	12.488	18.478	23.928	3.883	6.486	7.889	8.887	9.888	1.184	2.852	1.748	4.742					
4852.8	4.896	6.784	12.778	18.871	24.188	3.898	6.938	7.898	8.998	18.185	1.928	2.282	1.938	4.973					
4858.2	4.874	6.988	12.948	19.178	24.282	4.887	8.418	8.887	8.891	18.248	1.932	2.284	1.933	5.788					
4856.7	4.988	7.882	18.218	19.874	24.752	4.488	8.788	8.832	1.884	18.447	1.873	2.341	8.288	5.117					
4856.2	5.858	7.158	18.888	28.218	25.781	4.184	8.878	8.882	12.184	18.778	8.845	2.418	2.484	5.248					
4858.7	5.178	7.821	18.481	28.877	26.947	4.318	7.823	8.888	18.944	11.181	2.138	8.578	2.981	5.913					
4861.2	5.288	7.888	18.418	21.432	27.474	4.482	7.911	8.727	11.878	11.478	2.248	2.863	2.183	5.744					
4862.6	5.413	7.881	18.861	22.367	28.481	4.681	7.784	6.828	11.524	12.188	2.158	2.867	2.834	6.878					
4864.1	5.849	7.878	18.258	23.183	29.781	4.752	8.187	11.884	12.878	12.774	2.482	2.974	2.812	8.482					
4869.9	5.671	8.867	19.829	28.458	38.824	6.487	8.411	18.488	13.816	13.258	2.615	2.141	3.184	6.731					
4868.9	5.781	8.295	18.814	24.758	81.924	5.868	8.715	18.918	13.188	13.888	2.743	3.314	3.311	7.865					
4868.3	5.919	8.439	14.881	25.548	33.588	5.291	8.891	11.348	13.718	14.922	2.873	3.444	3.936	7.547					
4868.7	6.343	8.818	17.258	26.844	34.859	5.387	9.838	18.771	14.254	15.888	3.885	3.941	3.787	7.721					
4871.1	8.184	8.784	11.738	27.885	35.867	5.539	8.828	19.178	14.781	15.147	3.124	2.434	3.871	8.858					

Table 7-1 $\left[\int_{\Delta\nu}(1-T)d\nu\right]$ (continued)

Sam. No.																			
p(atm)	1.50 x 10^0	2.33 x 10^0	2.53 x 10^0	7.50 x 10^0	3.00 x 10^0	1.000 x 10^0	1.000 x 10^0	1.16 x 10^-1	1.30 x 10^-1	1.30 x 10^-1	1.47 x 10^-1	7.70 x 10^-2	7.70 x 10^-2	7.70 x 10^-2	1.31 x 10^-2	2.36 x 10^-2	2.36 x 10^-2	2.36 x 10^-2	6.47 x 10^-2
P_e(atm)	3.21 x 10^0	8.32 x 10^0	3.31 x 10^0	7.29 x 10^0	2.62 x 10^0	1.31 x 10^0	1.31 x 10^0	1.50 x 10^-1	1.00 x 10^-1	8.90 x 10^-1	3.03 x 10^-2	1.001 x 10^-1	1.03 x 10^-1	1.00 x 10^-1	1.11 x 10^-1	1.06 x 10^-1	1.08 x 10^-1	1.00 x 10^-1	6.70 x 10^-2
w(atm cm) STP	2.47 x 10	1.11 x 10^5	3.37 x 10^4	8.81 x 10^4	8.71 x 10^4	6.62 x 10^4	1.13 x 10^4	9.44 x 10^3	8.85 x 10^3	8.65 x 10^3	3.32 x 10^3	1.32 x 10^3	3.32 x 10^3	3.32 x 10^3	1.01 x 10^3	1.01 x 10^3	1.01 x 10^3	1.01 x 10^3	1.01 x 10^3
ν (cm⁻¹)	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4136 cm⁻¹	ν¹-4536 cm⁻¹	ν¹-4379.3 cm⁻¹	ν¹-4379.3 cm⁻¹	ν¹-4379.1 cm⁻¹	ν¹-4379.3 cm⁻¹	ν¹-4706 cm⁻¹	ν¹-4706 cm⁻¹	ν¹-4706 cm⁻¹	ν¹-4706 cm⁻¹	ν¹-4706 cm⁻¹
4872.4	244.055	242.050	174.173	147.220	140.003	107.200	107.310	00.020	00.344	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4878.6	234.235	254.958	175.973	140.270	195.204	100.200	150.310	64.974	100.772	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4879.1	237.555	245.590	174.073	152.524	109.904	102.900	142.210	00.022	101.070	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4474.4	238.005	256.040	172.171	141.070	107.004	101.000	141.210	09.210	103.210	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4877.6	240.005	284.950	170.973	153.070	109.004	102.220	142.210	00.047	124.307	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4878.4	241.305	200.390	102.473	154.320	220.304	103.320	102.012	00.127	100.270	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4840.1	242.555	210.550	101.073	145.424	901.404	199.090	149.012	00.102	104.090	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4841.6	243.755	211.750	102.073	150.774	207.704	150.700	109.210	00.550	107.770	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4842.4	244.055	212.050	144.173	197.070	203.0[illegible]	107.092	107.310	04.020	100.274	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4843.7	246.145	214.150	102.473	150.174	205.10[illegible]	[illegible]3.100	140.012	99.777	100.207	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4844.0	247.055	219.050	193.473	160.370	204.024	223.300	140.01[illegible]	00.007	113.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4846.0	244.455	214.450	[illegible].773	141.474	227.404	221.400	192.011	00.200	111.937	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4847.1	249.555	217.550	[illegible]04.873	147.774	274.504	922.904	102.375	00.057	112.373	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4840.2	250.055	210.050	105.973	143.470	204.404	223.020	133.704	02.937	110.190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4840.7	251.055	214.450	140.073	160.070	210.004	224.050	194.073	40.003	113.022	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 7-1 $\left[\int_0^\infty (1-T)\,d\nu\right]$ (continued)

ν (cm^{-1})	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	ν_{4475} cm^{-1}	$\nu_{4475.0}$ cm^{-1}	$\nu_{4800.0}$ cm^{-1}	$\nu_{4800.0}$ cm^{-1}	$\nu_{4800.4}$ cm^{-1}	ν_{4801} cm^{-1}	ν_{4801} cm^{-1}	ν_{4801} cm^{-1}	ν_{4801} cm^{-1}	ν_{4801} cm^{-1}
4872.0	6.200	8.045	10.886	27.694	36.228	0.672	0.002	10.052	12.296	16.126	3.272	2.074	4.012	6.288					
4872.9	6.304	9.102	10.897	28.017	37.003	0.700	10.171	12.288	15.722	16.613	3.169	4.199	6.162	8.969					
4874.1	6.2908	8.208	10.824	29.168	37.847	0.922	10.918	12.548	15.698	17.272	3.429	4.276	6.274	8.784					
4876.6	6.018	7.818	10.872	29.362	38.240	0.827	10.858	12.825	15.644	17.266	3.567	4.190	6.275	8.996					
4878.8	6.711	9.071	10.891	29.998	39.129	0.2122	10.827	12.779	15.701	17.264	3.932	4.284	6.498	8.147					
4879.9	6.988	9.071	20.919	30.827	40.017	0.922	11.012	12.281	17.918	17.969	3.626	4.476	6.526	8.477					
4880.1	6.968	9.889	20.967	31.261	42.578	0.2366	11.144	14.192	13.223	18.168	3.688	4.561	6.964	8.476					
4881.3	6.9968	9.982	20.981	31.899	41.868	0.2381	11.319	14.353	17.426	18.278	3.783	4.175	6.244	8.928					
4882.4	7.2073	10.018	22.783	32.237	41.461	0.429	11.021	14.684	17.529	18.515	3.768	4.088	6.492	8.997					
4883.7	7.1168	10.186	21.229	32.378	41.949	0.492	11.032	14.997	17.868	18.688	3.782	4.932	6.216	8.272					
4884.9	7.944	12.224	26.219	32.845	42.136	0.892	11.959	16.888	17.744	18.758	3.212	4.648	6.743	9.726					
4886.0	7.318	10.324	21.267	42.866	42.351	0.992	11.955	16.885	17.798	18.221	3.226	4.276	6.261	9.366					
4887.1	7.078	10.276	21.697	33.815	42.922	0.998	11.878	16.883	17.838	18.277	3.232	4.986	6.273	9.369					
4889.2	7.1836	10.443	21.883	33.173	43.358	0.992	11.778	16.813	17.872	18.327	3.644	4.672	6.281	8.894					
4889.2	7.496	10.964	24.788	33.967	42.963	0.698	11.756	16.836	17.891	18.059	3.298	4.987	6.289	9.243					
4892.6	7.866	12.908	21.887	53.487	47.879	0.638	11.737	16.822	17.912	18.402	3.853	4.736	6.297	9.862					
4893.6	7.496	12.673	28.948	33.967	48.818	0.751	11.888	16.822	17.937	18.825	3.897	4.713	6.744	9.898					
4893.5	7.724	12.3719	28.959	33.691	43.157	0.728	11.836	16.917	17.957	19.162	4.298	4.718	6.982	8.913					
4894.6	7.787	10.823	22.179	33.886	43.021	0.764	11.859	16.936	17.979	19.869	3.788	4.726	6.287	9.911					
4896.2	7.992	10.886	22.369	33.926	43.362	0.708	11.886	16.984	17.992	19.122	3.256	4.729	6.213	9.892					
4897.2	7.912	10.949	22.368	34.041	43.496	0.814	11.929	16.988	18.213	19.191	3.897	4.715	6.219	8.973					
4898.5	7.672	11.812	23.446	34.178	43.764	0.832	11.939	19.216	18.892	19.181	3.898	4.276	6.675	8.991					
4899.4	9.268	10.874	22.869	34.898	47.679	0.862	11.988	19.648	18.241	19.312	3.878	4.318	6.818	10.214					
4901.8	8.988	11.126	23.898	36.414	43.779	0.884	11.984	19.988	18.648	19.261	3.832	4.748	6.884	10.232					
4902.6	8.148	11.122	22.742	34.818	43.878	0.869	11.981	19.822	18.884	19.286	3.895	4.741	6.841	10.249					
4904.9	8.197	11.248	29.818	34.613	43.989	0.829	12.219	15.882	18.897	19.282	3.839	4.711	6.844	10.843					
4905.2	9.239	11.286	22.489	34.763	44.838	0.868	12.821	19.828	15.176	19.319	3.839	4.741	6.851	10.878					
4909.4	9.285	11.237	22.959	34.782	44.113	0.898	12.894	19.128	18.115	19.837	3.881	4.741	6.959	10.864					
4907.8	8.348	11.269	23.833	34.883	44.159	0.878	12.878	19.164	18.125	19.397	3.788	4.741	6.958	10.249					
4908.8	8.2395	11.444	22.881	34.963	44.262	0.885	12.868	19.868	18.148	19.379	3.881	4.741	6.861	10.191					
4910.8	8.2467	11.887	22.121	35.848	44.348	7.811	12.798	19.184	18.182	19.389	3.888	4.742	6.864	10.234					
4911.1	9.522	11.982	22.873	36.165	44.661	7.838	12.128	19.881	18.173	19.418	3.878	4.744	6.867	11.148					
4912.2	8.837	11.896	23.823	36.266	44.989	7.888	12.115	19.818	18.178	19.479	3.886	4.743	6.873	10.781					
4914.2	8.728	11.778	22.819	35.446	44.698	7.898	12.149	19.798	18.227	19.478	3.824	4.792	6.879	10.196					
4916.2	8.2872	11.918	23.969	36.844	44.277	5.124	12.129	19.891	18.261	19.595	3.898	4.761	6.788	10.219					
4919.8	9.878	12.191	23.991	35.941	45.186	5.288	12.259	19.868	18.218	19.687	3.898	4.768	6.886	10.257					
4921.8	9.267	12.874	24.281	36.283	45.483	7.782	12.234	19.898	19.349	19.628	3.988	4.778	6.914	10.336	0.827	0.867	4.814	8.881	4.818
4924.8	9.423	12.67	24.486	36.985	45.228	7.366	12.934	19.958	18.479	19.786	3.928	4.784	6.838	10.345	0.806	0.813	4.825	8.811	4.818
4926.6	9.7829	12.883	24.828	38.598	46.267	5.468	12.929	19.887	18.992	19.828	3.968	4.818	6.863	10.446	0.869	0.871	4.844	8.876	4.788
4928.7	8.777	12.881	28.139	37.449	46.783	7.977	12.261	19.892	18.741	19.888	3.812	4.448	6.289	10.138	0.114	0.814	4.866	8.859	4.814
4931.8	9.965	13.889	28.826	38.281	47.487	7.718	12.833	19.886	18.947	22.328	4.826	4.484	6.944	10.676	0.828	0.866	4.868	8.849	4.879
4933.2	10.171	13.226	29.978	38.868	48.188	7.898	12.248	19.231	18.211	20.859	4.879	4.867	5.112	10.861	0.818	0.886	5.113	8.876	4.137
4934.8	10.802	13.851	31.466	39.429	49.111	8.817	13.288	19.884	18.951	20.961	4.158	5.819	6.217	10.988	0.842	0.884	5.144	8.878	4.188
4937.8	10.923	12.838	27.994	40.331	50.212	9.211	12.811	17.868	19.287	21.495	4.788	5.196	6.578	11.213	0.888	0.886	5.171	8.871	4.174
4939.8	10.748	14.629	27.718	41.351	51.467	9.429	13.878	17.857	19.973	22.825	4.877	5.189	6.483	11.949	0.859	0.898	5.219	8.876	4.287
4942.8	10.692	14.417	28.369	42.376	52.863	8.889	13.368	18.268	21.171	22.738	4.527	5.862	.888	11.988	0.181	0.196	5.868	9.271	4.758
4944.1	11.192	14.893	28.897	43.467	54.337	8.877	14.878	18.828	21.887	23.969	4.888	5.736	.834	12.448	0.188	0.196	4.322	9.343	4.197
4946.1	11.2488	15.861	29.857	44.897	55.288	5.161	15.882	17.888	22.717	24.424	4.892	6.162	6.828	12.948	0.188	0.196	4.419	9.388	4.448
4948.2	11.277	15.421	29.741	45.974	57.598	2.879	15.897	24.778	22.711	25.867	5.183	6.844	6.988	13.812	0.288	0.882	4.482	9.472	4.466
4951.2	11.2942	15.812	30.831	47.331	58.265	2.797	18.437	20.868	24.188	26.859	5.988	6.761	7.884	14.344	0.248	0.888	4.412	9.545	4.487
4954.2	12.291	17.376	32.884	48.784	61.868	18.168	17.824	21.491	29.928	28.117	9.898	7.184	7.871	15.178	0.88	0.896	4.738	9.751	4.768
4956.2	13.878	18.216	33.968	50.896	62.888	18.989	17.721	22.643	23.171	28.838	9.888	7.844	8.816	15.869	2.328	2.716	4.878	8.884	4.847
4958.1	14.8.4	17.156	34.898	51.838	64.653	18.932	18.489	23.812	28.431	30.898	4.338	8.217	8.844	17.876	8.598	8.961	5.894	9.852	5.111
4956.8	13.178	17.828	35.821	51.828	66.857	11.325	19.216	24.966	28.747	32.496	4.872	8.784	9.289	19.847	8.881	8.886	5.185	9.241	5.283
4958.8	15.588	18.823	36.918	54.866	68.221	11.788	18.896	26.989	31.173	34.335	5.188	8.488	8.877	19.178	8.484	8.886	5.358	9.497	5.867
4961.7	15.823	18.958	32.998	56.363	78.815	12.882	20.868	28.825	33.421	35.988	7.248	10.832	10.966	48.277	9.868	9.878	5.838	9.878	5.864
4963.6	16.168	19.132	36.872	57.885	71.648	12.983	21.487	27.886	33.886	37.118	7.718	10.641	10.268	51.366	9.823	9.868	5.714	9.857	5.857
4965.6	16.142	19.948	38.168	58.429	73.588	12.988	22.113	26.873	35.159	38.495	8.868	11.378	11.861	57.492	9.888	9.888	5.888	9.868	5.183
4967.1	16.892	19.891	42.189	59.884	73.254	13.761	22.767	28.214	36.494	40.128	8.488	11.968	12.821	61.936	8.722	8.984	5.881	9.874	5.287
4968.5	19.178	20.858	43.288	62.888	74.818	13.868	23.478	28.864	37.741	41.541	8.763	12.594	13.268	64.999	8.583	8.774	5.894	9.878	5.485
4978.8	19.488	28.993	48.387	63.763	78.864	14.848	24.287	31.643	38.819	42.648	9.112	13.164	13.977	88.984	8.847	8.878	5.841	9.117	5.868
4972.2	18.788	21.389	44.348	64.272	80.713	14.418	24.928	32.866	38.858	44.296	9.888	13.888	14.487	88.467	8.888	8.888	5.784	9.784	5.818
4973.8	18.8871	21.784	45.248	66.978	81.747	14.988	25.988	33.8	41.368	45.487	9.781	14.137	14.8	87.868	8.871	8.868	5.817	9.878	5.774
4975.8	18.2389	22.216	48.268	67.889	82.848	15.172	26.231	34.888	42.346	46.938	10.838	14.584	15.264	72.881	8.824	8.868	5.818	9.878	5.861
4977.8	18.873	22.844	48.438	68.473	85.171	15.883	26.874	34.887	43.897	47.764	10.878	14.814	16.828	74.818	8.878	8.818	5.894	9.894	5.144
4978.4	18.888	22.874	48.277	73.891	86.461	15.838	27.898	38.668	44.811	48.821	10.834	15.863	16.871	78.898	1.112	7.384	6.968	9.183	5.718
4978.8	17.138	23.368	48.821	71.898	88.183	17.867	28.883	38.888	44.888	48.836	10.888	15.314	16.283	78.878	1.185	2.442	7.868	9.878	5.878
4982.4	17.388	23.778	58.867	73.118	89.287	18.481	28.893	38.887	45.848	48.837	10.963	15.736	16.841	88.368	1.288	2.844	7.475	8.4	5.871
4983.8	17.844	24.118	58.928	74.328	88.858	18.884	29.878	37.888	47.288	51.827	11.887	16.224	17.281	81.141	1.285	2.858	7.728	9.958	5.878
4989.2	17.988	24.997	51.899	79.867	98.869	17.8.4	29.894	38.818	48.173	52.888	11.887	16.784	17.731	87.883	1.398	2.784	8.849	9.729	5.767
4986.9	18.291	28.818	52.928	76.887	93.442	17.832	28.844	38.788	48.372	54.163	11.478	17.481	18.177	93.877	1.363	8.928	7.873	8.841	5.847
4988.8	18.948	28.857	55.847	78.237	94.962	18.838	31.284	44.868	58.903	59.858	12.448	18.868	18.[illegible]	94.876	1.444	3.878	8.844	8.167	6.188
4989.3	18.188	28.842	58.168	79.659	98.185	18.888	32.843	41.887	51.733	58.447	12.486	18.868	18.787	98.998	1.581	3.876	8.832	8.372	6.477
4992.8	12.8849	28.238	58.767	88.268	97.448	12.778	48.888	42.867	58.281	57.888	13.748	19.367	19.374	98.978	1.887	3.884	8.748	8.967	6.887
4991.9	18.313	28.831	58.774	81.891	98.742	19	51.388	44.488	54.637	58.111	13.388	18.919	19.868	18.844	1.913	3.892	8.448	8.861	6.884
4992.1	19.982	28.862	87.871	81.816	88.842	19.417	34.813	48.317	58.288	68.238	14.718	28.518	21.814	17.838	1.868	5.817	4.421	4.888	9.482
4994.8	19.781	23.844	88.483	84.133	121.141	19.731	34.812	48.448	58.128	61.396	14.838	21.178	21.728	11.746	1.718	3.784	4.788	7.184	9.187
4996.8	28.878	27.478	89.218	85.838	122.318	28.938	35.781	48.448	57.888	62.851	14.838	21.911	22.751	12.548	1.888	3.884	4.888	7.388	9.388
4998.7	28.218	27.883	89.883	87.884	128.827	28.388	38.791	48.317	58.188	63.628	14.828	22.187	23.318	44.361	1.868	8.867	4.187	7.817	9.828
4997.8	28.288	28.288	88.488	87.318	184.818	28.998	38.248	47.988	58.888	64.484	14.888	28.938	23.782	41.844	1.898	8.849	4.218	8.881	9.892
4998.9	28.188	28.958	81.888	88.887	188.288	28.784	38.318	48.888	58.887	68.888	18.118	22.911	24.187	41.887	1.887	8.188	8.168	8.747	9.787
4988.8	28.788	28.778	88.418	88.188	188.488	28.488	38.818	48.818	58.814	68.187	18.318	23.298	24.888	42.271	1.821	8.288	8.438	8.882	8.881
8288.8	28.888	28.878	82.488	88.928	187.882	21.187	38.888	48.148	61.238	68.828	18.882	23.941	24.788	42.788	1.883	8.888	8.818	8.884	8.787
8941.8	28.871	28.171	88.828	88.714	188.878	21.337	37.847	48.881	61.988	68.888	18.882	23.738	24.888	43.188	1.888	8.188	8.888	8.818	8.811
9882.2	21.898	28.788	78.441	81.481	188.481	21.488	38.188	48.887	68.888	68.888	18.818	83.878	24.128	43.488	2.818	8.288	8.834	8.872	8.871
[illegible]	21.288	28.828	88.844	82.188	[illegible]	21.648	38.481	48.988	61.234	68.732	18.888	84.183	24.383	43.828	8.881	8.881	8.878	8.128	8.188
8[illegible]	21.288	28.881	84.118	82.788	111.887	21.788	38.881	48.288	63.418	67.188	18.888	84.278	24.878	44.838	8.887	8.878	8.838	8.188	8.187
[illegible]	21.372	28.781	88.888	83.248	111.778	21.888	38.888	48.988	61.787	68.418	18.188	84.378	24.478	44.888	8.887	8.888	8.748	8.182	8.187
7888.8	21.888	28.872	88.788	83.888	118.188	21.888	38.888	48.888	63.871	68.727	18.188	84.388	24.888	44.888	8.887	8.888	8.748	8.287	8.287
1981.8	21.188	28.988	88.818	84.878	112.778	22.821	38.188	48.888	64.187	68.884	18.238	84.888	24.888	44.888	2.118	8.888	8.787	8.218	8.278

Table 7-1 $\left[\int_0^\infty (1-T)d\nu\right]$ (continued)

Table 7-1 $\left[\int_0^\infty (1-T)\,d\nu\right]$ (continued)

Elem. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
p(atm)	1.65 x 10⁻⁸	7.68 x 10⁻⁷	8.11 x 10⁻⁶	2.37 x 10⁻⁵	2.17 x 10⁻⁴	9.11 x 10⁻⁴	6.55 x 10⁻³	6.51 x 10⁻²	8.35 x 10⁻²	6.51 x 10⁻²	6.31 x 10⁻¹	6.31 x 10⁻¹	1.08 x 10⁻¹	1.08 x 10⁻¹	4.12 x 10⁻⁰	4.13 x 10⁻¹	4.12 x 10⁻¹	6.18 x 10⁻¹	8.18 x 10⁻¹
P_e(atm)	8.07 x 10⁻⁸	2.99 x 10⁻⁷	8.82 x 10⁻⁶	1.000 x 10⁰	3.07 x 10⁰	6.31 x 10⁻³	8.00 x 10⁻³	1.04 x 10⁰	3.08 x 10⁰	1.002 x 10¹	8.00 x 10¹	1.02 x 10¹	1.091 x 10¹	1.084 x 10¹	3.61 x 10⁰	8.97 x 10⁻¹	1.003 x 10⁰	3.00 x 10⁰	1.000 x 10¹
u(atm cm) STP	3.26 x 10²	1.29 x 10²	1.30 x 10²	1.30 x 10²	1.30 x 10²	6.96 x 10¹	9.96 x 10¹	6.96 x 10¹	6.96 x 10¹	6.96 x 10¹	6.96 x 10¹	2.50 x 10¹	2.30 x 10¹	1.08 x 10¹	6.26 x 10⁰	6.26 x 10⁰	6.26 x 10⁰	6.26 x 10⁰	6.26 x 10⁰

ν (cm^{-1})	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-475	ν^1-4800.4	ν^1-4800.4	ν^1-4800.4	ν^1-4801	ν^1-4801	ν^1-4801	ν^1-4801	ν^1-4801
9868.1	21.966	89.849	66.886	84.488	118.185	212888	98.384	91.996	86.383	78.887	16.878	24.478	25.737	44.548	1.118	9.568	9.769	6.858	1.748
9868.9	21.888	88.888	66.886	84.868	118.474	29.148	98.884	91.897	84.418	78.818	16.868	24.588	99.788	44.611	8.187	6.971	9.885	6.242	1.258
9499.7	21.873	88.197	65.999	84.888	118.648	29.197	98.469	91.786	84.982	78.888	16.819	24.581	99.788	44.698	9.188	6.978	9.813	6.251	1.281
9818.4	21.768	88.898	65.998	84.887	118.789	21.947	98.911	91.988	84.956	78.378	16.188	24.545	99.883	44.668	8.188	6.948	9.818	6.256	1.276
9811.9	21.787	88.819	65.968	84.888	119.7.9	28.298	98.998	91.884	84.611	78.441	16.841	24.588	99.818	44.718	8.1.8	6.984	9.178	6.268	1.277
9918.6	21.768	88.848	66.889	84.898	118.779	28.825	98.998	91.877	84.888	78.467	16.388	23.574	99.886	44.742	8.188	6.984	9.629	6.8 8	1.777
9918.6	21.788	88.888	66.881	84.898	118.885	28.398	98.816	91.884	84.888	78.588	16.388	24.578	99.882	44.748	7.188	6.184	9.825	6.845	1.777
9914.7	21.818	88.278	66.848	84.881	119.818	21.388	98.878	91.818	84.888	78.597	16.388	24.578	99.818	44.748	7.188	6.944	9.825	6.845	1.777
9818.8	21.838	88.287	65.895	84.828	119.836	21.378	98.886	91.988	84.985	78.576	16.198	24.578	99.827	44.778					
9814.9	21.858	88.298	65.869	84.838	119.449	29.398	98.842	91.883	84.911	78.588	16.398	24.578	99.837	44.778					
9917.8	21.878	88.911	66.872	84.844	118.888	21.888	98.847	91.889	84.717	78.481	16.886	24.578	99.837	44.774					
9816.8	21.888	88.885	65.878	84.861	118.871	21.488	98.888	91.866	84.782	78.611	16.898	24.878	99.817	44.774					
9819.6	21.868	88.913	66.887	84.877	118.881	21.488	98.884	91.893	84.928	78.821	16.896	24.578	99.887	44.774					
9816.8	21.818	88.388	65.883	84.881	118.881	82.487	98.878	91.888	84.929	78.828	16.894	24.578	99.887	44.774					
9824.8	21.831	88.388	65.888	84.888	118.887	28.488	98.881	91.883	84.739	78.888	16.898	24.578	99.837	44.774					
9822.8	21.848	88.876	66.385	85.887	118.888	28.487	98.884	91.888	84.735	78.848	16.896	24.578	99.837	44.774					
9823.6	21.858	88.896	65.911	84.138	118.818	22.441	98.867	91.874	84.748	78.851	16.886	24.878	99.837	44.774					
9824.8	21.872	88.366	65.917	84.115	118.821	22.447	98.871	91.888	84.744	78.858	16.898	24.878	99.837	44.774					
9825.8	21.4585	88.988	65.728	84.129	118.831	28.488	98.878	91.898	84.758	78.868	16.894	24.878	99.817	44.778					
9826.7	27.819	88.381	65.384	84.119	118.841	22.488	98.889	91.887	84.788	78.878	16.884	24.578	99.837	44.774					
9826.4	22.846	88.887	65.748	84.151	118.897	82.476	98.868	92.811	84.788	78.887	16.353	24.878	99.837	44.774					
9826.4	22.888	88.426	66.768	85.177	118.878	87.488	98.988	92.829	84.744	78.718	16.898	24.578	99.837	44.774					
9812.8	28.188	88.447	66.788	85.288	118.898	82.988	98.788	92.888	84.748	78.788	16.888	24.578	99.817	44.774					
9814.4	21.178	88.458	66.788	85.251	118.818	22.928	98.781	92.884	84.748	78.784	16.888	24.578	99.837	44.774					
9818.4	28.787	88.472	65.818	85.256	118.888	82.918	98.921	91.879	84.771	78.788	16.888	24.578	99.837	44.774					
9813.4	28.788	88.888	65.827	88.881	118.847	88.898	98.718	92.884	84.771	78.888	16.888	24.578	99.837	44.774					
9848.8	28.777	88.888	65.841	88.388	114.161	82.947	98.778	92.188	84.779	78.888	16.858	24.478	99.837	44.774					
9848.7	27.814	88.826	66.858	85.381	114.888	77.978	98.748	93.118	84.777	78.848	16.856	24.578	99.787	44.774					
98-4.9	22.387	88.946	65.888	88.388	114.184	22.926	98.751	92.188	84.782	78.871	16.854	24.878	99.887	44.774					
9847.8	22.488	88.966	66.919	88.418	114.141	22.964	98.768	92.198	84.781	78.899	16.398	24.578	[illegible]	44.774					
9846.1	87.488	88.888	88.878	88.478	114.187	22.888	98.768	92.178	84.918	78.882	16.898	24.541	[illegible]	44.774					
9851.2	27.828	88.894	88.888	88.888	114.178	22.838	98.818	98.818	84.848	78.887	16.358	24.544	[illegible]	44.777					
9851.9	22.888	88.788	88.188	88.888	114.188	22.898	98.868	97.298	84.888	71.888	16.388	24.548	[illegible]	44.788					
9898.8	72.898	88.794	88.888	88.818	114.948	72.488	98.888	98.813	84.881	71.861	16.177	24.588	99.881	44.888					
8897.8	22.728	88.814	88.881	88.888	114.748	22.728	98.887	88.388	84.882	71.181	16.888	24.878	99.887	44.878					
8898.8	22.798	88.878	88.988	88.788	115.884	21.787	98.817	98.478	85.873	71.887	14.437	24.618	98.888	44.888					
9881.8	87.871	88.898	88.888	88.477	115.838	22.828	98.188	88.588	88.188	71.118	16.438	24.843	[illegible]	44.888					
9888.8	27.988	88.824	88.847	88.888	115.788	21.881	98.278	82.718	81.831	71.488	16.478	24.874	99.838	44.888					
9828.8	23.817	88.148	88.888	88.888	115.748	21.847	98.888	88.888	84.888	71.888	16.328	24.718	99.883	44.887					
9897.8	23.188	88.284	88.818	87.888	116.887	21.498	98.988	88.888	85.798	71.8.4	16.488	24.778	99.838	45.887					
8898.8	282198	88.871	88.887	88.174	117.888	23.118	98.782	88.888	88.887	72.788	18.858	24.888	98.112	45.881					
8871.1	87.8998	88.888	88.828	[illegible]	118.882	23.288	98.988	88.881	88.8.8	73.881	18.788	24.951	98.188	45.947					
8871.9	21.888	88.788	88.888	[illegible]	118.822	23.387	98.884	88.184	88.188	73.888	17.886	[illegible]	98.5.8	45.771					
9874.8	83.518	88.737	88.888	188.873	178.881	23.488	88.888	88.888	87.188	73.998	17.848	25.288	98.888	45.828					
9878.7	23.838	88.888	88.182	188.878	181.887	23.187	88.748	84.771	87.848	74.188	17.878	98.878	98.818	45.818					
9878.7	23.773	88.884	88.881	181.887	182.778	23.781	88.888	88.888	88.444	74.788	17.918	25.887	98.783	45.878					
9885.8	23.811	88.793	78.148	182.898	184.837	88.838	82.881	88.883	88.881	74.888	17.168	88.777	98.888	47.881					
9888.1	24.488	88.488	78.878	183.482	185.351	84.883	88.788	84.178	88.788	74.251	17.918	88.881	97.121	47.448					
9889.8	24.211	88.872	71.848	184.842	186.788	74.178	88.148	88.113	78.824	77.858	17.878	18.778	97.481	47.878					
9889.7	24.388	8.488	71.887	188.378	188.881	14.488	88.998	87.884	71.888	77.888	17.888	18.484	17.718	48.488					
9887.4	24.921	88.114	79.843	188.381	8 8.428	84.448	87.832	87.819	79.744	73.781	18.488	18.738	17.488	48.848					
9889.1	24.488	88.881	78.831	187.831	118.748	84.847	44.817	98.878	79.722	79.588	18.188	88.488	98.118	48.187					
9888.8	24.898	88.978	78.881	188.281	118.888	25.148	44.781	98.928	78.911	88.287	18.888	87.978	98.888	51.747					
9888.8	25.881	88.888	78.888	188.888	118.888	28.784	88.448	88.888	88.188	88.888	18.888	87.788	98.888	51.151					
9884.1	25.177	84.888	78.792	113.118	184.574	17.417	48.488	88.888	74.788	81.447	18.888	87.878	98.887	48.518					
8898.7	25.317	84.883	79.887	118.878	188.874	25.888	48.788	88.888	78.888	83.177	18.788	87.747	98.828	48.288					
8897.3	25.481	84.888	78.878	111.728	188.888	25.747	44.815	88.748	78.881	87.588	18.888	87.818	98.148	51.814					
8898.8	25.188	84.887	78.888	111.488	137.881	15.887	44.888	81.838	78.888	88.488	18.878	78.881	98.888	51.213					
9181.2	25.718	84.772	78.881	111.834	188.188	26.813	88.418	81.888	[illegible].288	88.788	18.887	88.888	98.111	51.148					
9149.7	25.851	84.885	77.888	111.428	188.978	88.188	48.871	81.888	[illegible].818	88.482	18.888	88.147	98.418	51.948					
9134.2	26.887	85.114	77.857	114.438	148.881	88.388	47.814	81.988	77.148	84.188	18.188	78.841	98.998	51.831					
9188.7	26.184	85.841	78.177	118.148	141.218	28.871	47.418	82.928	77.788	84.888	18.887	78.448	98.748	48.187					
9197.1	28.848	85.885	78.758	118.287	148.488	18.777	47.787	88.888	78.483	85.588	18.584	88.724	98.888	48.587					
9188.8	18.981	85.885	78.458	117.341	143.711	27.417	48.748	88.878	78.237	88.882	18.788	88.881	98.238	51.378					
9118.8	28.718	88.888	88.178	118.344	144.988	27.298	48.881	84.888	78.988	87.188	18.988	88.841	98.488	53.948					
9111.4	28.888	88.838	82.878	118.118	148.788	27.488	48.188	88.884	88.778	87.887	88.117	88.941	98.778	54.881					
9112.8	27.888	88.883	87.881	178.228	147.281	27.788	48.883	89.817	81.488	88.488	28.884	28.783	91.828	44.988					
9114.1	27.272	28.884	87.857	171.268	148.418	27.918	48.888	88.888	88.388	88.588	88.488	18.888	91.138	44.888					
9119.8	27.488	87.874	87.788	178.888	148.871	28.188	88.888	88.888	88.888	88.877	88.547	91.888	88.888	44.828					
9118.8	27.981	87.812	88.828	171.148	151.812	28.188	88.788	87.188	81.728	81.124	28.848	38.488	91.888	45.881					
9118.8	87.718	87.838	88.882	178.981	182 '87	28.888	91.884	87.888	84.848	81.734	21.888	38.884	97.888	48.132					
9119.2	87.858	87.71	88. 18	174.878	151.118	28.748	91.481	88.188	88.888	82.484	21.847	31.848	97.783	48.781					
9128.8	27.888	87.884	88.877	178.888	151.888	28.888	91.888	88.888	88.888	82.887	21.284	31.178	97.431	47.884					
9171.7	18.128	88.118	88.888	178.227	154.884	28.887	88.888	88.884	88.888	88.438	21.888	31.318	97.878	47.871					
9178.9	88.741	88.878	88.888	178.884	18'.818	29.188	88.888	88.884	88.888	88.888	21.491	31.441	97.788	47.888					
9134.1	28.388	88.448	88.888	177.488	158.888	28.381	88.48.	88.888	88.888	84.114	21.978	31.948	98.812	47.888					
9178.8	88.481	88.548	88.488	178.877	157.811	88.488	88.888	88.777	88.881	84.888	21.848	31.828	98.888	47.888					
9178.8	88.588	88.788	88.781	178.947	157.844	28.917	88.888	88.888	87.287	84.882	21.788	31.778	98.878	47.783					
9177.8	28.481	88.818	88.978	178.148	158.488	28.188	88.888	88.188	87.8	85.881	21.788	31.781	98.884	48.888					
8181.7	88.788	88.941	87.888	178.817	158.888	28.718	88.147	88.872	87.882	85.828	21.881	31.878	98.874	48.184					
9178.8	28.458	38.848	87.878	178.888	158.448	28.818	88.278	88.888	87.781	85.887	21.448	31.841	98.128	48.878					
9188.8	28.882	28.188	87.838	178.182	158.881	28.918	88.888	88.887	87.841	85.587	21.878	31.871	98.181	48.844					
9188.8	28.188	88.488	88.888	181.878	168.828	18.188	88.888	88.888	88.888	85.981	21.888	31.884	98.287	48.818					
9179.1	28.388	38.818	88.788	181.438	161.787	18.288	88.881	88.113	88.882	86.838	21.888	31.988	98.278	48.581					
9138.6	28.418	38.748	88.781	181.812	161.418	18.188	88.871	88.848	88.888	88.178	21.818	38.818	98.818	48.888					
9137.8	28.918	38.888	88.8.8	182.188	161.828	88.418	84.888	88.888	88.888	88.288	21.888	88.888	98.188	48.388					
9138.8	28.887	88.788	87.881	182.888	162.238	88.488	84.888	88.881	88.887	88.887	21.887	88.188	98.188	48.788					
9148.8	28.887	48.888	88.788	187.888	167.888	88.888	84.888	88.8.2	88.888	88.888	21.888	88.888	98.888	48.888					
9141.7	28.778	48.148	88.872	188.813	167.832	38.887	84.888	88.888	88.877	88.988	21.888	88.888	98.888	48.857					
9143.8	28.858	48.238	88.181	188.178	168.848	88.888	84.884	88.888	88.888	88.877	21.118	88.188	98.888	48.847					

Table 7-1 $\left[\int_0^\infty (1-T)d\nu\right]$ (continued)

Sam. No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
g(atm)	2.50 x 10^0	5.57 x 10^0	1.51 x 10^1	5.36 x 10^1	1.00 x 10^2	1.000 x 10^2	1.000 x 10^2	1.16 x 10^{-1}	9.30 x 10^{-3}	2.20 x 10^{-3}	1.07 x 10^{-3}	7.70 x 10^{-7}	7.70 x 10^{-7}	7.70 x 10^{-7}	1.18 x 10^{-7}	2.34 x 10^{-2}	2.34 x 10^{-2}	2.34 x 10^{-2}	4.47 x 10^{-1}
P_e(atm)	3.29 x 10^0	1.30 x 10^0	3.32 x 10^0	1.29 x 10^0	1.02 x 10^0	1.31 x 10^0	1.32 x 10^0	1.50 x 10^{-1}	1.00 x 10^{-1}	9.99 x 10^{-2}	7.93 x 10^{-2}	1.001 x 10^{-1}	1.01 x 10^{-1}	1.000 x 10^{-1}	1.55 x 10^{-2}	3.06 x 10^{-2}	1.01 x 10^{-1}	1.00 x 10^{-1}	8.70 x 10^{-2}
w(cm-atm) STP	1.17 x 10^{-3}	1.11 x 10^{-3}	3.37 x 10^{-3}	0.81 x 10^{-3}	0.71 x 10^{-3}	0.45 x 10^{-3}	2.10 x 10^{-3}	4.55 x 10^{-3}	9.05 x 10^{-3}	0.01 x 10^{-3}	1.32 x 10^{-3}	3.32 x 10^{-3}	3.13 x 10^{-3}	3.31 x 10^{-3}	1.01 x 10^{-1}	1.01 x 10^{-3}	1.01 x 10^{-3}	1.01 x 10^{-3}	1.01 x 10^{-3}
ν (cm^{-1})	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	ν_{-4536} cm^{-1}	$\nu_{-4579.1}$ cm^{-1}	$\nu_{-4579.1}$ cm^{-1}	$\nu_{-4579.3}$ cm^{-1}	$\nu_{-4579.3}$ cm^{-1}	ν_{-4704} cm^{-1}	ν_{-4704} cm^{-1}	ν_{-4704} cm^{-1}	ν_{-4704} cm^{-1}	ν_{-4704} cm^{-1}
5140.2	544.699	474.448	445.278	411.444	407.498	392.862	388.621	319.408	340.333	148.938	103.188	387.389	389.334	89.791	78.379	118.487	159.958	868.768	
5140.5	547.735	478.583	444.474	412.564	406.934	390.366	388.366	667.787	313.271	338.291	146.187	103.483	387.741	189.041	89.896	78.851	118.389	158.188	861.124
5140.9	544.985	474.781	444.474	410.744	407.134	390.788	386.329	383.395	314.283	341.585	146.438	103.594	387.737	188.617	89.968	78.854	118.781	156.454	861.468
5147.7	544.199	477.085	447.774	414.044	408.138	390.988	389.788	384.648	313.893	341.159	146.782	104.001	388.749	187.332	89.688	78.757	118.662	158.719	811
5148.0	543.398	474.183	448.474	414.144	409.534	390.189	390.671	384.669	313.849	340.312	146.848	104.002	388.915	187.999	89.788	78.679	118.183	158.044	887.167
5149.8	547.384	480.183	449.474	417.144	478.934	481.186	387.844	330.139	316.433	194.141	147.148	144.652	388.984	288.486	85.784	78.969	111.886	157.116	887.818
5151.0	514.655	481.983	454.174	418.642	477.934	484.686	389.446	329.679	317.368	198.411	147.498	179.982	343.148	288.325	85.938	78.181	111.881	157.186	887.695
5152.0	548.985	482.583	457.198	418.844	471.216	469.878	486.247	766.368	317.688	198.688	147.818	183.216	346.415	288.371	85.977	78.574	111.987	157.481	887.738
5153.5	514.985	483.787	451.444	78.791	474.119	468.769	481.894	686.611	318.198	198.981	147.749	184.374	346.486	288.646	86.015	78.311	111.669	157.549	887.830
5154.7	517.195	484.483	454.745	421.644	475.314	467.956	482.886	686.985	318.664	197.817	147.085	185.868	348.919	288.192	86.185	78.388	111.748	157.682	887.946
5156.0	514.495	444.381	456.514	421.941	478.595	468.388	483.821	387.897	317.161	197.878	148.378	179.747	348.168	288.451	86.179	78.384	111.817	157.776	888.141
5157.0	514.458	447.288	458.869	423.847	477.597	478.324	483.712	685.669	319.368	198.318	148.189	185.084	349.118	289.649	86.738	78.457	111.898	157.817	888.117
5158.2	520.495	448.781	457.494	424.841	478.577	471.167	488.291	387.948	319.738	198.691	148.569	183.988	348.889	289.889	86.788	78.474	111.846	157.887	888.197
5159.8	521.454	449.271	458.369	425.372	479.551	473.136	486.878	388.273	320.843	198.318	148.189	185.896	349.669	289.854	86.885	78.911	111.989	157.988	888.196
5160.4	523.467	444.754	458.237	426.844	480.588	478.838	489.963	684.875	158.277	359.388	148.476	188.181	341.699	291.851	86.388	78.946	113.829	157.898	881.829
5161.8	525.468	441.722	460.647	428.844	481.437	471.918	488.887	688.867	323.474	198.958	148.948	188.347	349.788	291.148	86.880	78.871	113.649	157.873	881.959
5162.8	524.464	442.163	466.424	427.144	488.332	474.748	488.307	388.788	322.841	359.781	148.686	188.315	341.883	291.822	86.385	78.989	114.874	157.981	881.774
5163.7	524.485	447.478	461.758	427.644	485.185	476.513	488.758	688.644	322.888	359.949	148.888	188.287	342.858	291.866	86.418	78.814	114.811	158.011	881.799
5164.8	526.484	443.051	462.145	428.641	483.986	476.782	487.878	388.977	321.893	360.135	148.788	188.414	342.981	291.869	86.448	78.814	114.114	158.037	881.811
5165.0	527.484	444.778	462.774	428.473	484.744	476.861	487.346	389.099	321.833	359.838	148.748	188.488	342.888	291.389	86.458	78.891	114.115	158.039	881.829
5148.0	524.445	485.549	445.137	428.818	468.447	477.966	487.868	669.387	351.139	348.349	148.777	188.488	348.738	291.486	88.479	78.886	119.849	158.846	881.937
5147.0	524.184	486.756	448.748	428.144	468.884	476.138	469.767	689.675	351.218	348.444	148.618	188.911	348.888	291.456	88.488	78.478	118.197	158.859	881.348
5148.0	528.132	486.487	448.288	427.348	468.673	478.869	489.873	689.358	321.685	348.978	148.838	138.918	348.881	291.487	88.488	78.888	119.146	158.889	881.389
5148.8	528.878	447.478	448.948	428.878	487.188	478.116	488.134	689.411	191.344	347.988	148.868	188.938	348.588	291.586	88.388	78.888	119.178	158.869	881.344
5178.8	527.716	447.866	448.448	428.754	487.512	476.486	488.848	689.498	191.387	348.541	148.888	188.971	348.118	291.978	88.911	78.781	119.177	158.871	881.367
5171.0	552.478	446.384	449.174	429.848	487.974	478.788	488.313	389.898	191.498	348.901	148.988	188.983	348.944	88.518	78.781	118.178	158.872	881.348
5172.0	547.981	448.783	449.311	418.871	488.281	488.848	488.489	389.837	191.448	1.718	148.918	188.988	348.188	291.84	88.518	78.784	118.178	158.872	881.388
5173.0	547.486	449.978	448.441	418.192	488.948	488.348	488.472	389.968	191.47	348.738	148.978	188.481	348.138	291.881	88.518	78.784	118.178	158.872	881.348
5174.0	548.987	449.748	448.491	418.847	488.778	488.428	488.926	389.888	191.498	348.748	148.988	188.884	348.148	291.988	88.518	78.784	118.178	158.872	881.348
5175.8	548.841	447.488	448.788	418.894	488.939	488.528	488.548	389.889	191.584	348.788	148.848	188.888	348.148	291.974	88.5913	78.784	118.178	158.872	881.348
5178.8	548.781	448.817	448.428	418.348	488.138	488.728	488.888	389.819	321.917	348.881	148.918	189.888	348.147	291.988	88.813	78.784	118.178	158.872	881.348
5177.8	549.878	448.914	448.448	418.878	488.119	488.898	488.837	389.838	191.938	348.814	148.937	188.888	348.118	291.988					
5176.8	534.114	448.191	448.153	418.887	488.878	488.878	488.847	389.849	321.888	348.888	148.888	188.888	348.118	291.988					
5178.8	548.988	448.148	448.258	418.918	488.978	488.888	488.888	389.867	321.888	348.887	148.918	188.888	348.133	291.888					
5148.8	538.888	448.481	448.348	418.947	488.481	488.178	488.888	388.718	289.888	321.999	348.88.	148.938	188.888	348.188	291.888				
514..8	548.178	547.867	448.448	478.847	488.884	481.318	488.731	388.889	321.944	348.888	148.978	188.888	348.138	291.883					
5141.8	534.577	548.838	448.438	478.778	488.848	481.478	488.781	389.888	321.888	348.888	148.988	188.888	348.188	291.887					
5148.8	534.888	542.188	448.778	478.841	488.778	481.887	488.381	388.742	321.978	348.818	148.988	188.888	348.158	291.818					
5147.4	547.288	548.831	448.888	418.844	488.388	481.778	488.388	388.748	321.987	348.827	148.988	188.888	348.158	291.818					
5149.1	547.948	548.978	447.478	418.814	488.544	481.917	488.888	389.788	321.881	348.888	148.888	188.888	348.158	291.818					
5191.2	537.481	548.771	447.147	478.841	488.783	483.868	488.888	388.849	321.818	348.878	148.988	188.888	348.158	291.818					
5148.8	548.178	548.828	447.287	411.848	488.488	483.588	488.888	389.832	321.897	348.881	148.988	188.888	348.158	291.818					
5148.8	538.918	582.188	447.788	411.187	488.881	484.388	489.833	389.898	321.878	348.888	148.988	188.888	348.158	291.818					
5199.8	538.877	582.418	447.437	411.181	488.918	483.888	489.883	388.881	321.894	348.829	148.988	188.888	348.158	291.818					
5148.8	538.298	582.448	447.441	411.341	488.418	488.888	489.188	389.888	321.878	348.888	148.988	188.888	348.158	291.818					
5248.2	538.888	582.878	447.418	411.348	488.818	488.188	488.888	388.888	321.898	348.878	148.988	188.888	348.158	291.818					
5241.8	548.118	584.788	448.881	411.818	488.848	488.288	488.288	388.888	321.728	348.887	148.988	188.888	348.138	291.818					
5242.7	544.988	548.587	448.178	411.948	488.878	488.488	488.318	388.888	321.748	348.139	148.988	188.888	348.138	291.818					
5248.2	548.817	548.888	448.178	411.387	487.898	488.388	488.388	388.888	321.738	348.132	148.988	188.888	348.138	291.818					
5248.8	548.488	544.158	448.488	411.841	487.888	488.858	488.888	388.888	321.198	348.198	148.988	188.888	348.138	291.818					
5248.8	548.881	548.888	448.888	411.748	487.737	488.188	488.888	388.878	321.318	348.881	148.988	188.888	348.138	291.818					
5218.8	548.287	548.488	448.828	411.871	487.888	488.378	488.888	388.888	321.818	348.881	148.988	188.888	348.138	291.818					
5219.1	548.588	548.887	448.888	411.878	488.871	488.888	488.888	388.888	321.888	348.888	148.988	188.888	348.138	291.818					
5213.7	548.837	548.878	448.888	411.918	488.187	488.888	488.888	388.888	321.888	348.888	148.988	188.888	348.138	291.818					
5218.1	548.889	548.248	448.188	411.888	488.288	488.788	488.888	388.888	321.878	348.228	148.988	188.888	348.138	291.818					
5217.7	548.188	548.188	448.778	411.883	488.818	488.878	488.788	388.188	321.887	348.888	148.988	188.888	348.138	291.818					
5218.8	548.128	548.488	448.288	411.888	488.888	488.818	488.788	388.188	321.888	348.838	148.988	188.888	348.138	291.818					
5218.8	548.478	548.677	448.848	411.878	488.888	488.138	488.778	388.818	321.888	348.888	148.988	188.888	348.138	291.818					
5227.3	548.728	548.788	448.888	411.878	488.781	488.298	488.818	388.228	321.888	348.778	148.988	188.888	348.138	291.818					
5228.8	548.857	548.118	448.888	411.888	488.888	488.478	488.888	388.888	321.888	348.778	148.988	188.888	348.138	291.818					
5228.8	548.868	548.298	448.888	411.888	488.888	488.888	488.887	388.888	321.888	348.795	148.888	188.888	348.138	291.818					
5228.7	548.748	548.488	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5228.2	548.138	548.748	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5228.8	548.828	548.818	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5248.8	548.888	547.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5238.8	548.888	548.488	448.818	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5239.8	548.878	548.881	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5248.8	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5241.8	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5247.8	548.287	548.188	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5248.2	548.878	548.817	448.887	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5244.2	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5244.2	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5246.2	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5246.2	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5246.2	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5242.8	548.788	547.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5244.8	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5246.8	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					
5248.8	548.888	548.888	448.888	411.888	488.888	488.888	488.888	388.888	321.888	348.888	148.888	188.888	348.138	291.818					

Table 7-1 $\left[\int_{z_0}^{z}(1-T)\,dz\right]$ (continued)

Num. No.	a	b	c	d	e	f	g	aa	ab	ac	ad	ae	af	ag
p(atm)	1.01 × 10^{-3}	7.61 × 10^{-3}	2.17 × 10^{-1}	7.11 × 10^{-3}	2.12 × 10^{-1}	6.54 × 10^{-3}	6.55 × 10^{-1}	6.55 × 10^{-2}	6.55 × 10^{-1}	6.55 × 10^{-2}	6.11 × 10^{-2}	6.55 × 10^{-2}	1.79 × 10^{-2}	1.13 × 10^{-1}
τ_a(atm)	9.92 × 10^{-3}	2.99 × 10^{-4}	2.82 × 10^{-1}	1.00 × 10^{0}	1.07 × 10^{0}	6.51 × 10^{-3}	3.00 × 10^{-1}	1.04 × 10^{0}	1.07 × 10^{0}	1.00 × 10^{0}	3.08 × 10^{-1}	3.08 × 10^{0}	1.00 × 10^{0}	1.004 × 10^{0}
w(cm cm) 2TP	1.29 × 10^{0}	1.29 × 10^{0}	1.30 × 10^{0}	1.30 × 10^{0}	1.30 × 10^{0}	9.96 × 10^{1}	9.96 × 10^{1}	6.96 × 10^{1}	6.96 × 10^{1}	6.96 × 10^{1}	1.30 × 10^{1}	1.30 × 10^{1}	1.30 × 10^{1}	1.01 × 10^{1}

ν (cm^{-1})	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}= cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=473 cm^{-1}	ν^{-1}=4800.4 cm^{-1}	ν^{-1}=4800.4 cm^{-1}	ν^{-1}=4800.4 cm^{-1}	ν^{-1}=4800.4 cm^{-1}
>146.8	66/916	49.981	98.889	199.366	168.840	36.[illegible]	[illegible]	71.999	84.899	96.761	99.196	82.168	38.483	96.966
9149.3	29/985	49.867	98.666	183.996	168.482	36.778	94.699	71.886	84.896	96.787	97.196	98.196	38.444	99.999
9146.6	38/868	49.637	99.858	183.689	166.963	36.916	94.897	78.898	89.896	96.949	97.149	96.196	38.498	99.677
9147.1	38/118	49.964	99.848	183.799	163.999	36.999	94.987	71.889	90.181	96.896	97.148	98.918	38.464	99.996
9149.9	38/191	49.967	98.787	183.839	163.788	36.899	94.618	71.928	84.196	96.969	98.146	98.227	38.479	96.813
9149.9	36.899	49.616	99.869	183.911	163.966	39.493	94.698	78.969	89.179	66.997	82.168	98.936	38.476	96.895
9191.6	38/389	49.869	98.966	184.916	161.966	37.639	94.991	71.967	89.286	97.886	98.177	82.867	38.468	96.841
9149.6	38/886	49.625	96.966	184.897	169.819	31.967	94.961	78.981	84.219	97.853	97.178	82.991	38.483	99.149
9193.9	38/866	49.496	98.991	184.961	169.667	36.966	94.667	78.898	84.299	97.836	96.179	82.[illegible]	38.497	96.666
9194.7	38/497	49.491	91.614	134.184	164.888	36/981	94.573	79.691	89.949	97.896	97.178	82.957	38.969	99.891
9196.6	38/469	49.866	96.641	134.191	164.119	31.889	94.976	78.611	89.898	97.888	28.179	69.[illegible]	38.966	99.869
9197.8	38/498	49.868	61.868	134.159	164.147	31.869	94.976	78.816	89.896	97.876	28.179	69.861	37.968	99.869
9198.8	38/926	49.883	91.976	134.193	164.198	31/919	94.979	78.896	89.869	97.888	28.179	68.268	37.911	96.866
9196.8	38/867	49.894	61.867	134.192	164.167	31.936	94.976	78.827	89.864	97.898	28.179	68.268	37.919	99.869
9149.8	38/968	49.861	61.939	134.199	164.177	31.866	94.676	78.869	89.866	97.188	28.179	68.264	37.819	96.869
9161.1	36/946	49.879	66.866	134.184	164.186	31/836	94.676	72.929	89.866	97.186	29.179	39.266	37.914	96.869
9179.8	36/498	49.881	61.169	134.986	164.184	31.838	94.674	72.826	86.868	97.118	22.186	68.266	37.916	96.869
9163.8	36/817	49.888	96.189	134.913	164.167	31/869	94.976	72.926	89.869	97.119	69.179	98.264	37.914	96.866
9164.1	38/836	49.995	61.817	134.919	164.199	31/888	94.679	72.826	84.868	97.191				
9145.8	36/961	49.998	61.814	134.619	164.191	31/898	94.979	76.826	89.866	97.198				
9166.8	36/849	49.906	99.816	134.826	164.198	31/839	94.679	76.826	89.868	97.199				
9167.8	38/896	49.819	61.817	134.672	164.163	31/888	94.679	76.826	89.869	97.198				
9168.8	38/861	49.913	61.119	134.223	164.164	31.898	94.979	76.826	89.869	97.198				
9169.8	38/866	49.715	61.119	134.624	164.194									
9170.8	38/866	49.815	61.119	134.824	164.194									
9171.8	38/866	49.815	96.119	134.826	164.196									
9172.8	38.866	49.815	99.119	134.826	164.196									
9172.8	38/866	49.815	99.119	164.264	164.196									

Table 7-1 $\left[\int_0^\infty (1-T)d\nu\right]$ (continued)

Sam. No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
p(atm)	2.30 x 10^0	2.15 x 10^0	2.33 x 10^0	2.30 x 10^0	2.00 x 10^0	1.000 x 10^0	1 x 10^0	1.16 x 10^{-1}	7.30 x 10^{-2}	2.30 x 10^{-1}	1.07 x 10^{-2}	2.70 x 10^{-3}	7.70 x 10^{-2}	7.7[illegible] x 10^{-4}	1.16 x 10^{-3}	5.84 x 10^{-2}	7.36 4 10^{-2}	2.34 x 10^{-2}	4.67 n 10^{-1}
P_e(atm)	3.19 x 10^0	3.32 x 10^0	3.32 x 10^0	3.26 x 10^0	3.42 x 10^0	3.31 x 10^0	1.32 x 10^0	1.50 x 10^{-1}	1.00 x 10^{-1}	4.99 x 10^{-1}	3.03 x 10^{-2}	1.001 x 10^{-1}	1.01 x 10^{-1}	1.001 x 10^0	1.13 x 10^{-2}	5.84 x 10^{-2}	1.02 x 10^{-1}	3.06 x 10^{-1}	9.70 x 10^{-1}
u(atm cm) STP	2.17 x 10^3	1.11 x 10^3	5.17 x 10^2	2.01 x 10^4	4.71 n 10^4	8.48 x 10^4	2.18 x 10^4	8.84 x 10^3	9.41 x 10^3	4.63 x 10^3	3.32 x 10^3	5.17 x 10^3	3.32 x 10^3	3.32 x 10^3	3.01 x 10^3	1.01 x 10^3	1.01 x 10^3	1.01 x 10^3	1.01 x 10^3

ν (cm^{-1})	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4536 cm^{-1}	ν=4579.3 cm^{-1}	ν=4579.3 cm^{-1}	ν=4579.3 cm^{-1}	ν=4579.1 cm^{-1}	ν=4704 cm^{-1}	ν=4704 cm^{-1}	ν=4704 cm^{-1}	ν=4704 cm^{-1}	ν=4704 cm^{-1}
4272.8	543.960	514.974	474.841	495.605	501.487	494.302	413.488	398.037	332.941	380.203	148.822	188.088	243.154	291.810					
4274.5	541.469	515.627	478.171	491.240	501.831	494.816	413.688	366.847	332.811	362.307	148.938	188.788	240.898	291.810					
4276.2	541.595	518.184	479.545	492.434	499.366	418.779	398.075	383.891	332.804	148.439	188.618	240.197	291.810						
4278.3	542.611	516.467	478.864	493.867	499.467	418.946	396.763	373.160	380.467	148.998	188.819	243.163	291.810						
4281.9	543.487	517.671	476.913	493.498	498.381	412.198	398.887	333.840	380.903	148.879	188.842	243.178	291.841						
4284.8	545.218	514.474	477.186	496.234	496.446	407.398	413.385	398.968	331.383	383.958	148.888	188.889	240.196	291.864					
4286.8	546.880	518.861	477.453	496.478	495.428	408.898	413.737	393.183	883.987	380.888	148.898	188.716	242.825	291.760					
4288.5	548.781	521.329	478.949	497.344	498.475	409.468	414.171	393.257	333.988	383.889	149.189	188.723	240.388	291.762					
4288.7	549.748	521.128	488.169	498.857	496.228	881.829	414.841	393.918	332.997	382.878	149.178	188.842	242.879	291.888					
4292.8	577.581	574.183	598.842	498.511	498.188	883.887	419.948	398.911	334.188	388.884	149.217	188.842	242.481	881.938					
4298.8	574.162	595.618	491.788	498.887	718.588	888.868	418.888	398.883	334.894	383.878	149.898	188.822	89 .448	291.878					
4298.9	575.748	594.742	492.838	419.488	511.278	525.868	418.898	398.948	834.481	348.898	149.398	188.987	248.987	292.838					
4298.5	577.458	594.148	493.487	418.817	519.513	984.849	418.889	398.511	334.941	384.888	149.338	187.818	242.998	292.848					
4301.8	581.137	598.281	484.888	448.878	514.388	986.484	417.868	898.878	374.848	346.484	149.416	187.116	242.841	292.968					
4302.8	581.958	598.648	488.874	441.278	518.443	987.889	417.898	398.448	374.937	888.446	148.444	187.148	242.878	292.938					
4304.7	588.328	592.474	498.941	441.884	514.357	988.387	417.881	898.828	878.138	346.743	148.888	187.218	848.791	293.228					
4308.4	584.938	596.318	447.738	442.748	517.481	988.483	418.886	898.841	388.387	348.888	149.878	187.498	242.898	293.288					
4308.5	584.381	595.566	448.845	443.838	519.158	918.848	418.885	896.888	325.498	345.488	149.698	187.473	848.968	272.548					
4310.8	587.878	597.188	448.738	444.488	521.458	918.388	418.883	834.387	378.474	346.868	149.792	187.548	848.898	293.228					
4311.8	588.479	598.178	481.188	445.184	521.488	918.198	438.488	898.898	378.894	348.198	148.813	187.818	842.188	293.893					
4312.8	548.878	598.184	483.885	445.815	527.548	914.188	421.882	898.821	328.888	348.948	148.488	187.818	848.817	293.911					
4315.8	542.868	548.188	485.821	448.881	524.478	918.188	421.838	898.188	328.838	347.878	148.898	187.843	848.868	293.234					
4316.7	584.868	541.198	444.888	447.238	524.548	914.188	423.488	898.447	327.348	347.478	148.818	187.888	841.858	293.581					
4318.5	543.488	547.148	488.882	448.782	525.548	917.188	428.838	898.488	327.837	348.481	188.188	188.198	848.982	293.878					
4318.8	541.487	548.118	488.892	448.872	526.558	918.868	424.987	898.488	838.878	848.588	148.488	188.878	848.844	294.748					
4317.7	548.838	548.948	488.887	448.173	527.341	918.888	424.843	866.888	838.728	369.241	188.888	188.838	848.427	294.298					
4318.7	541.338	548.118	487.818	448.841	528.388	914.418	438.138	888.888	338.828	348.348	188.888	188.888	844.487	294.341					
4319.1	541.488	548.888	488.888	448.888	529.148	888.188	428.838	888.838	338.838	348.478	188.882	188.882	848.488	294.382					
4 .2.8	584.718	547.148	488.838	441.471	538.881	881.178	428.788	888.847	329.188	348.438	188.848	188.888	848.958	298.438					
4 .2.8	541.287	548.388	488.878	441.848	521.883	898.883	438.148	868.981	838.888	888.881	188.788	188.882	848.898	294.488					
4324.8	541.944	548.478	488.818	442.478	537.878	888.838	428.948	897.888	338.888	378.888	188.748	188.338	844.848	294.541					
4325.4	548.618	558.478	488.158	443.871	533.823	888.848	428.998	897.888	388.817	378.338	188.788	188.881	844.888	294.822					
4328.7	541.478	541.948	488.744	443.888	534.848	884.578	427.412	898.887	338.882	378.484	188.838	188.888	844.898	294.784					
4327.8	548.887	548.218	488.118	444.318	535.814	888.438	427.881	898.874	378.881	378.898	188.888	188.868	844.878	294.818					
4328.1	548.188	548.787	484.788	444.888	538.218	888.218	428.818	883.888	388.488	378.888	188.828	188.887	844.888	294.888					
4328.1	547.122	548.427	488.418	445.232	538.788	888.448	428.882	898.787	338.138	371.188	188.878	188.884	845.888	294.884					
4331.8	548.888	548.828	448.188	445.488	537.814	887.888	428.847	888.818	338.271	371.888	188.888	188.884	845.847	888.898					
4332.8	548.881	548.448	448.178	448.178	538.438	838.388	428.388	897.888	338.488	371.472	188.848	188.388	845.121	888.187					
4333.8	548.884	547.388	448.178	448.588	538.732	838.868	428.778	898.888	338.938	371.841	188.882	188.144	848.178	888.178					
4334.8	548.848	548.141	447.148	448.888	548.884	888.738	433.841	898.181	888.882	373.823	188.128	188.188	848.888	888.234					
4336.7	548.788	588.744	487.148	447.278	548.484	838.148	433.898	898.148	386.738	531.888	188.188	188.228	848.868	888.272					
4338.1	548.888	588.548	488.258	447.518	548.188	838.718	438.671	898.888	386.882	371.888	188.188	188.288	848.888	888.318					
4337.8	548.888	588.578	488.118	448.118	548.317	881.2868	438.888	898.871	338.987	888.118	188.188	188.288	848.888	888.372					
4338.8	548.788	588.188	488.478	448.298	547.887	881.2888	438.887	898.488	348.481	888.184	188.848	188.888	848.888	888.488					
4340.8	548.288	548.188	488.881	448.888	548.838	838.8498	431.898	898.488	881.818	888.818	188.778	188.288	848.412	848.484					
4342.8	548.788	548.888	488.888	448.848	544.138	882.878	431.128	898.938	888.818	888.888	188.388	188.888	848.488	888.488					
4344.8	548.888	548.881	488.418	448.487	548.387	882.888	431.188	898.888	388.888	888.888	188.888	188.888	848.438	888.488					
4346.8	548.188	548.847	488.888	448.118	548.478	838.488	431.188	898.888	888.881	888.888	188.888	188.288	848.488	888.488					
4348.8	548.788	548.188	488.847	448.818	548.448	832.448	431.188	898.888	881.818	888.888									
4348.8	548.478	548.288	488.788	448.318	548.828	832.448	431.188	898.888	881.818	888.888									
4352.8	548.138	548.288	488.722	448.878	548.847														
4354.8	548.258	548.288	488.722	448.878	548.847														
4356.8	548.148	548.248	488.788	448.878	548.847														
4347.5	548.171	548.248	488.788	448.878	548.847														
4348.8	548.178	548.288	488.788	448.878	548.847														
4348.8	548.178	548.288	488.788	448.878	548.847														
4348.2	548.178	548.248	488.788	448.878	548.847														
4348.8	548.178	548.248	488.788	448.878	548.847														
4348.8	548.178	548.248	488.788	448.878	548.847														

SECTION 8

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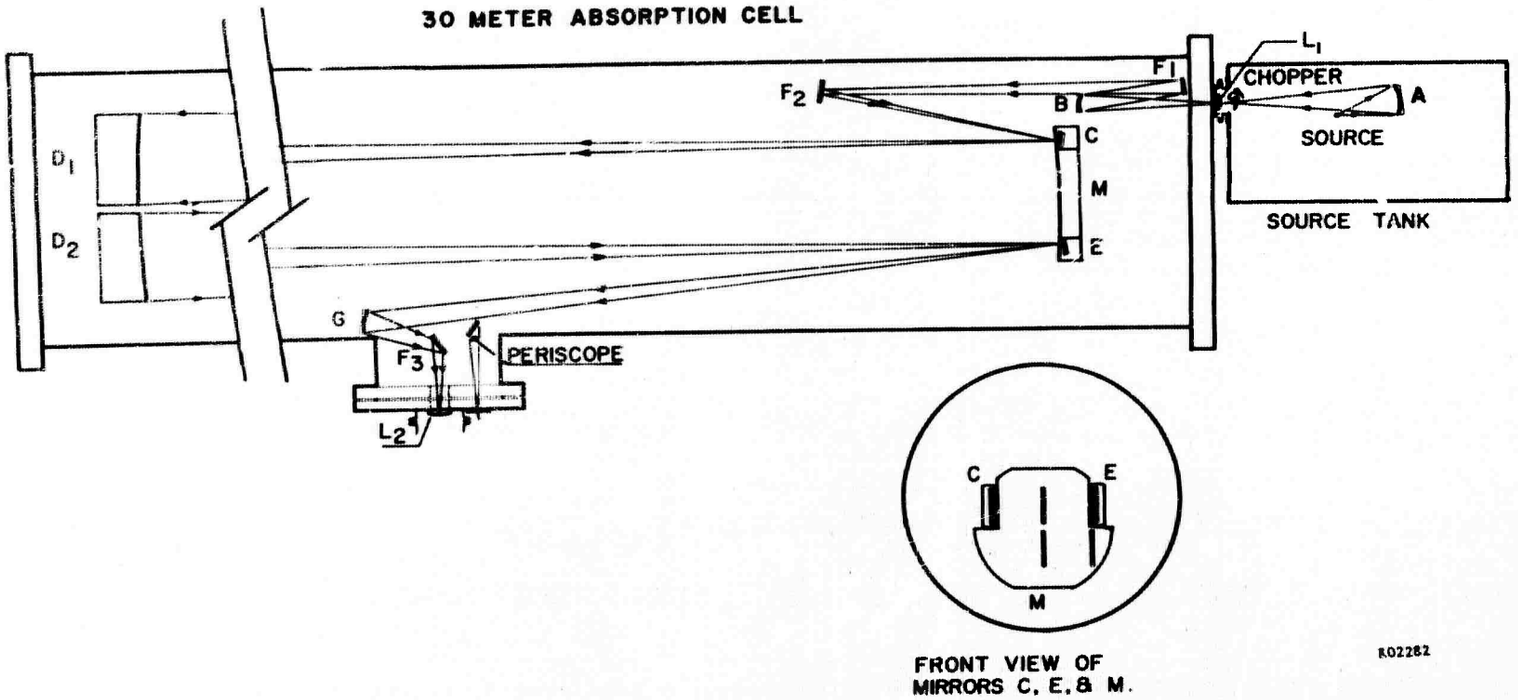
APPENDIX A

30-METER MULTIPLE-PASS CELL AND SOURCE TANK

Figure A-1 shows an optical diagram of a multiple-pass absorption cell with a base length of approximately 30 meters and an adjoining vacuum tank which contains a radiation source, chopper and mirrors. Light from a source is focused by mirror A on field lens L_1 which serves as a window. From there the light passes on to mirror B which forms an enlarged image of the source on mirror C. The light then passes through the multiple-pass optical system which is of the type described by White (J. Opt. Soc. Am. 32, 285 (1942)). After traversing the multiple-pass system a certain number of times, which depends on the settings of mirrors D_1 and D_2, an image of the source is formed on mirror E. The light then is directed to mirror G which re-images the source on field lens L_2, which also serves as the exit window. From here the radiation is focused on the entrance slit of one of two spectrometers which are available in the laboratory. F_1, F_2 and F_3 represent flat mirrors, and all mirrors are front surface aluminized.

The principle of the White multiple-pass system can be explained with the aid of the lower portion of Figure 1, which shows a front view of mirrors C, E and M, with the positions of the images shown on M when the system is adjusted for 8 passes. Light from the image on C travels to D_1 whose radius of curvature is equal to the distance between M and D_1; from there the light is reflected to form the lower right-hand image on M. M is a spherical mirror whose radius of curvature is, like D_1 and D_2, equal to the distance (29.0 meters) between M and D_1 or D_2. The center of curvature of M is mid-way between D_1 and D_2; therefore, all the light from the lower right-hand image falls on D_2, which re-focuses the beam to the image in the upper center portion of M. The light then goes to D_1 and to the lower left image on M, on to D_2 and back to E, from where it is directed to G and out of the cell. The optical path from L_1 to C and from E to L_2 is 5 meters; therefore the total path inside the cell is $5 + 29\ N$ meters, where N is the number of passes.



RO2282 FIGURE A-1. OPTICAL DIAGRAM OF THE 30-METER MULTIPLE-PASS ABSORPTION CELL AND SOURCE TANK

The lower portion shows a front view of mirrors C, E and M with the image pattern corresponding to 8 passes; the images are approximately 15 by 1.2 cm. The distance from M to D_1 and D_2 is 29 meters.

The number of passes of the beam before it strikes E is changed by rotating D_2 about a vertical axis. In many cells of this type, the number of passes is varied by moving both D_1 and D_2; however, it is only necessary to move one. D_1 and D_2 are D-shaped, both having been cut from a single mirror of 81 cm diameter, rather than from two circular mirrors, in order to obtain the maximum possible light gathering power with the 91 cm diameter tube in which the optics are installed. M is cut from a 46 cm diameter mirror.

Since the f-ratio of the multiple-pass system is large (approximately 75), it is necessary to use large images on C, E and M and to reduce them to the height of the entrance slit of the spectrometer in order to fill it properly. The images on C, E and M are approximately 15 cm high x 1.2 cm wide and are reduced to about 3.0 cm high at lens L_2. The image is further reduced by optics outside the cell to match the height of the entrance slit of the spectrometer being used. The entrance optics work in just the opposite manner; an enlarged image of the source is formed at L_1, and this image is further enlarged and formed on C. Mirrors B and G are similar, as are C and E.

Vignetting is avoided by using lenses L_1 and L_2 instead of flat windows and by using spherical mirrors C and E, rather than flats as is frequently done. Lens L_1 images mirror A on B; and C images B on D_1. Similarly, E images D_2 on G, which is imaged on another mirror that is outside the cell, but not shown in Figure A-1. The need for curved mirrors C and E, rather than flats, and for lenses L_1 and L_2 is not apparent from Figure 1, which shows only the rays in a horizontal plane. However, the need is clear when one considers the height of the images on C, E and M. For example, if C were replaced by a flat mirror, the necessary height of the beam at B in order for light to go from every point on the 15 cm high image to every usable point on D_1 is approximately 20 cm. The maximum height of the portion of D_1 which is used is about 60 cm, and the optical distance from B to C is approximately 210 cm, thus the height of the beam on B is only about

$$60 \times \frac{210}{2900} \approx 4.4 \text{ cm}$$

when C is used with B and D_1 at conjugate points. Similarly, if L_1 were a plane window, the necessary height of the beam at A would be much greater. A similar argument applies for E and lens L_2.

The loss that would arise from a slight error in the focal lengths of L_1 and L_2 is small; therefore, loss due to chromatic aberrations in the two lenses is negligible. The lenses, which are made from KBr, were ground to have the proper focal length for an intermediate wavelength of 3μ, so that the system can be used satisfactorily from the visible to 25μ. Since the f-ratio of the beam inside the cell is large and the reflections at B, C, E and G are nearly normal, these mirrors can be spherical without introducing a significant amount of aberration.

The front of M can be viewed through a small window and a flat mirror which is labelled as a periscope in Figure A-1. In this manner, it is possible to see the images on M and to determine the number of passe to which the system has been adjusted. Vertical and azimuthal adjustments can be made on both D_1 and D_2 from outside the cell by means of rotary seals. The adjustments on D_1 are used to position the first image on M; and the vertical adjustment on D_2 is used to place the centers of curvature of D_1 and D_2 at the same height. The azimuthal adjustment on D_2 is much finer and is used to change the number of passes.

The long cell is provided with a two-stage mechanical pump which is capable of attaining a pressure of a few tenths of a micron of Hg. The maximum pressure which can be used safely is about 2.5 atmospheres. Pressures are measured by a McLeod gauge, an oil manometer or an Hg manometer, depending on the pressure range. Electrical heating wire and insulation have been installed so that it is possible to heat the cell to approximately 70°C. Two fans inside the cell provide mixing when samples consisting of two or more gases are used.

It should be noted that the absorption cell was designed around the long pipe which was installed in the basement of the building as it was being erected before the authors were employed by Aeronutronic. For this reason, some of the things about the cell are not as they would be if the tube had not been previously installed. The cell could be improved somewhat if it were made of glass-lined steel or of stainless steel which could be honed to provide a very smooth inner surface. With either of these surfaces the adsorption of gases, particularly H_2O, on the walls would be less troublesome than with the rough steel walls which were used. It would also be more desirable if the cell were somewhat smaller and designed to hold higher pressures. If it were smaller, it would also be more practical to cool it to temperatures corresponding to the upper atmosphere.

The source tank is constructed of steel pipe having a 45 cm diameter and 6 mm wall thickness. A steel plate which has been welded in position approximately 8 cm below the horizontal diameter provides

a surface for mounting a chopper, a radiation source and mirrors. The tank can be connected to the long cell by the use of flexible bellows and can be evacuated to avoid errors due to absorption by atmospheric gases. The interior of the tank can be viewed through a window in the end plate farthest from the absorption cell. Small adjustments on mirror A, or on any other mirror which might be used, can be made from the exterior by the use of a rotating vacuum seal.

APPENDIX B

ONE-METER MULTIPLE-PASS ABSORPTION CELL

A shorter multiple-pass absorption cell has been constructed to supplement the 30-meter one in our laboratory. The shorter one, like the long one, has multiple-pass otpics using the principle described by White (J. Opt. Soc. Am. 32, 285 (1942)), with two mirrors at one end and a single mirror at the other end where the radiation enters and exits. The distance between the mirrors is 102.7 cm; and with an additional 4.8 cm ath inside the cell, the total path for N passes is

$$L(cm) = 4.8 + N\ (102.\ ).$$

Each of the two mirrors at the end opposite the windows has a useful area approximately 6 cm x 6 cm. Plano-convex lenses serve as windows to reduce vignetting. The height of the image at the single mirror is limited by the windows to approximately 4.5 cm. By means of a relatively simple set of mirrors, the image size can be reduced and the divergence of the beam increased in order to properly fill either of our monochromators, a Perkin-Elmer Model 99 or a "home-made" one utilizing a grating. The mirrors in the cell are coated with gold, rather than aluminum, because of the higher reflectivity of gold between 0.7 and 2 microns. In order to change the number of passes, the two mirrors at one end are rotated about vertical axes. This is accomplished by the use of a screw having left-hand threads on one end and right-hand threads on the other; the nuts are spring loaded against arms which extend approximately 70 cm in front of each mirror. The screw is coupled to an external crank through a rotating seal so that the number of passes can be changed without opening the cell or changing the sample.

A flat mirror mounted just below a small window in the top of the cell makes it possible to view the images on the single mirror near the windows. The number of passes can be determined from the image pattern.

The end of the cell containing the windows is fitted to a flexible bellows which is joined to a vacuum tank containing the remainder of the optics. Therefore, it is possible to essentially eliminate absorption by atmospheric gases outside of the cell.

The cell is constructed from a piece of stainless steel pipe 120 cm long with an I.D. of 15 cm. The inside of the pipe is honed to provide a smooth surface and reduce adsorption of gases on the wall. All of the mirror mounts are also made of stainless steel so that many gases which would corrode other metals can be studied.

The entire cell is wrapped with heating coils and insulation so that it can be heated to approximately 170°C. A separate heating circuit is supplied for each end plate and one for the main body of the cell; still another circuit supplies extra heat in the regions of the valves and thermocouple wells which would otherwise be cooler than the remainder of the cell. The resistance wire with asbestos insulation was threaded through copper tubing which was then wrapped around the cell and soft-soldered to it to provide a good thermal contact. Three thermocouples at different locations inside the cell make it possible to measure the temperature so that the power to each heater can be adjusted for a uniform temperature.

The cell can also be cooled by putting it in an insulated tub which was designed for the cell and can be filled with dry-ice, ice water or any other desired cooling material so that the cell is completely immersed in it. In most of the measurements which are anticipated, it will not be necessary to attain an exact temperature; therefore, a continuous temperature control is not essential. Dry-ice or ice water as refrigerants have the advantage that the temperature is self-controlled. Some temperatures between those of these two materials can probably be attained by using frozen mixtures of water and alcohol. At the present time, the cell has not been used at reduced temperatures.

APPENDIX C

DATA DIGITIZING SYSTEM

I INTRODUCTION

A system for analysis and presentation of spectrographic data has been developed. This system performs the following:

(1) The output of the spectrometer consisting of pen deflection as a function of prism or grating positions can be presented directly in digital form as pairs of numbers displayed on lamp bank indicators and punched and printed on standard IBM cards.

(2) One can take the original strip charts, make any corrections to account for the presence of any unwanted gas or impurities and fit in the appropriate background curve (the curve giving the pen deflection with the sample removed). These corrected data can be both replotted and digitized as percent deflection vs. grating or prism position. The digital values again are displayed and punched on standard IBM cards. This freedom to correct, modify and study a number of strip charts (each perhaps representative of the same phenomenon with some systematic change in some parameter of the experiment) before the material is digitized is extremely convenient and desirable.

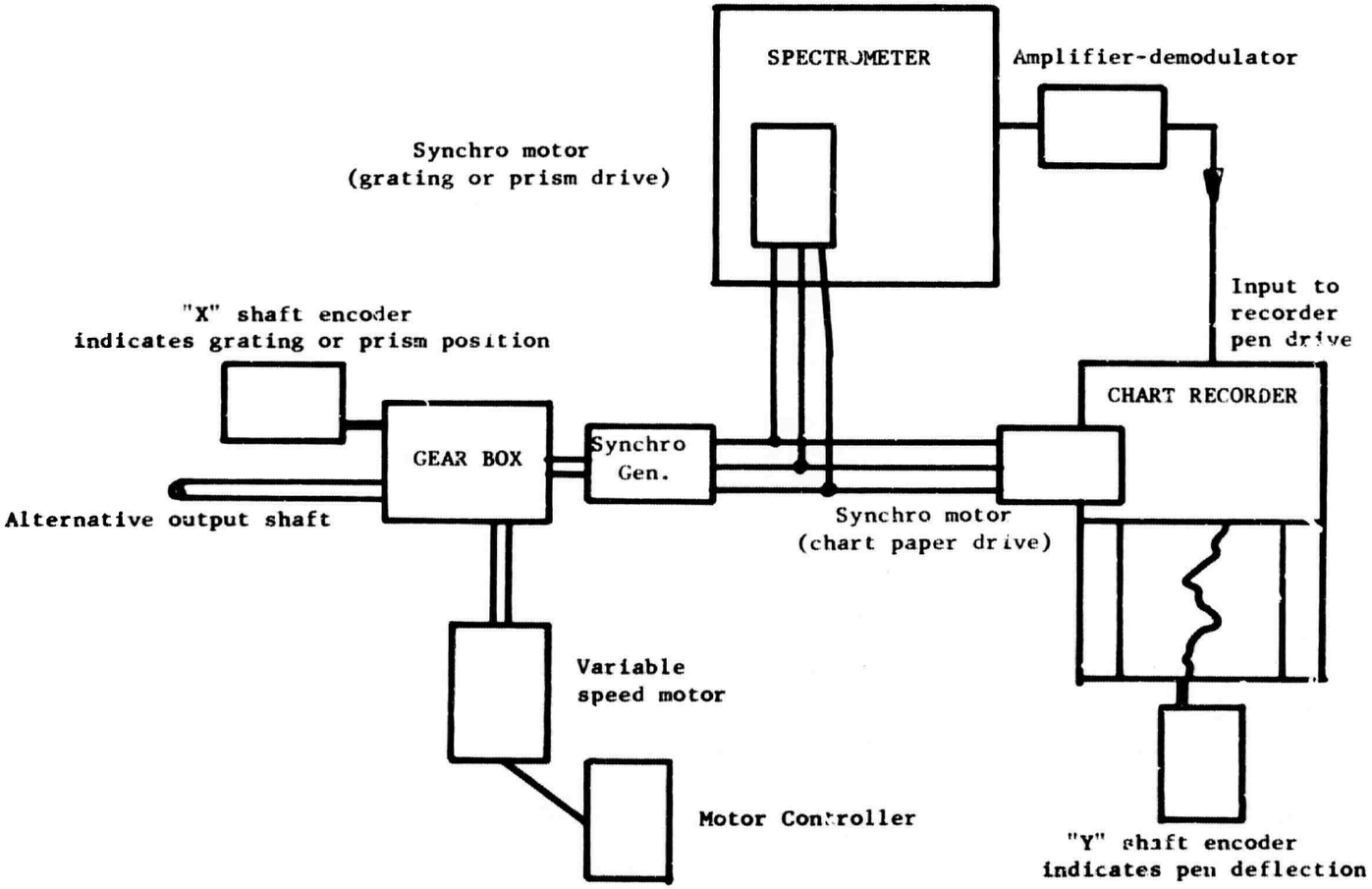
The pairs of data points can be taken at a rate slightly faster than one per second.

We will describe the system and its two basic modes of application in the following section.

II DESCRIPTION

a. <u>The Direct Digitizing System</u>

Figure C-1 shows the direct digitizing system. The spectrometer's prism or grating position, the chart advance of the strip chart recorder, and the X Shaft Encoder are driven directly or through "synchros" by a variable speed motor enabling one to match their speed to the nature of the spectrum. The slowest speed and the maximum density of recorded data points are selected to accurately present the spectrum in those regions where it is most complicated. By increasing the speed and/or reducing the density of recorded data points one can significantly reduce the total time required to cover the spectrum without loss of resolution. The gear ratios on the gear box are selected to establish the density of points derived from the



RO9911 FIGURE C-1. DIRECT DIGITIZING SYSTEM

X Shaft Encoder indicating the position of the grating or prism; the number of these points which are actually recorded is controlled by the Readout Control device described below. The electrical output of the spectrometer is amplified, demodulated, and applied to the chart recorder pen drive. The resulting pen deflection is measured by the Y Shaft Encoder. The outputs of the shaft encoders go to the data processor subsystem.

b. The Digitizer and Data Processor Subsystem

This subsystem was designed and manufactured by Coleman Electronic Systems, Santa Ana, California, to our specifications. It consists of the following:

(1) Shaft Encoders

Two shaft encoders are used. They indicate the angular position of their input shaft in terms of contact positions of ganged rotary switches. The one mounted on a chart recorder measures pen deflection in units 0000 to 1,000. The second encoder synchronized with the chart paper drive measures the distance along the chart paper in units 00000 to 99,999.

(2) Data Processor

On command for readout the data processor unit translates the contact positions of the shaft encoder into contact closures of several banks of relays. These contact closures are presented in two forms: as a visual, numerical display on a lamp bank; and as an output to drive an IBM summary punch.

(3) Readout Control

The density of recorded data points can be adjusted so that a readout cycle is initiated with each change of 1, 2, 5 or 10 units of the X Shaft Encoder. This enables one to increase the number of points in those regions where the spectrum is complicated.

(4) Summary Punch Control

This device samples the data stored in the data processor during the readout cycle in a sequence and form compatible with an IBM 526 Summary Punch which records the data on standard IBM cards. In addition,

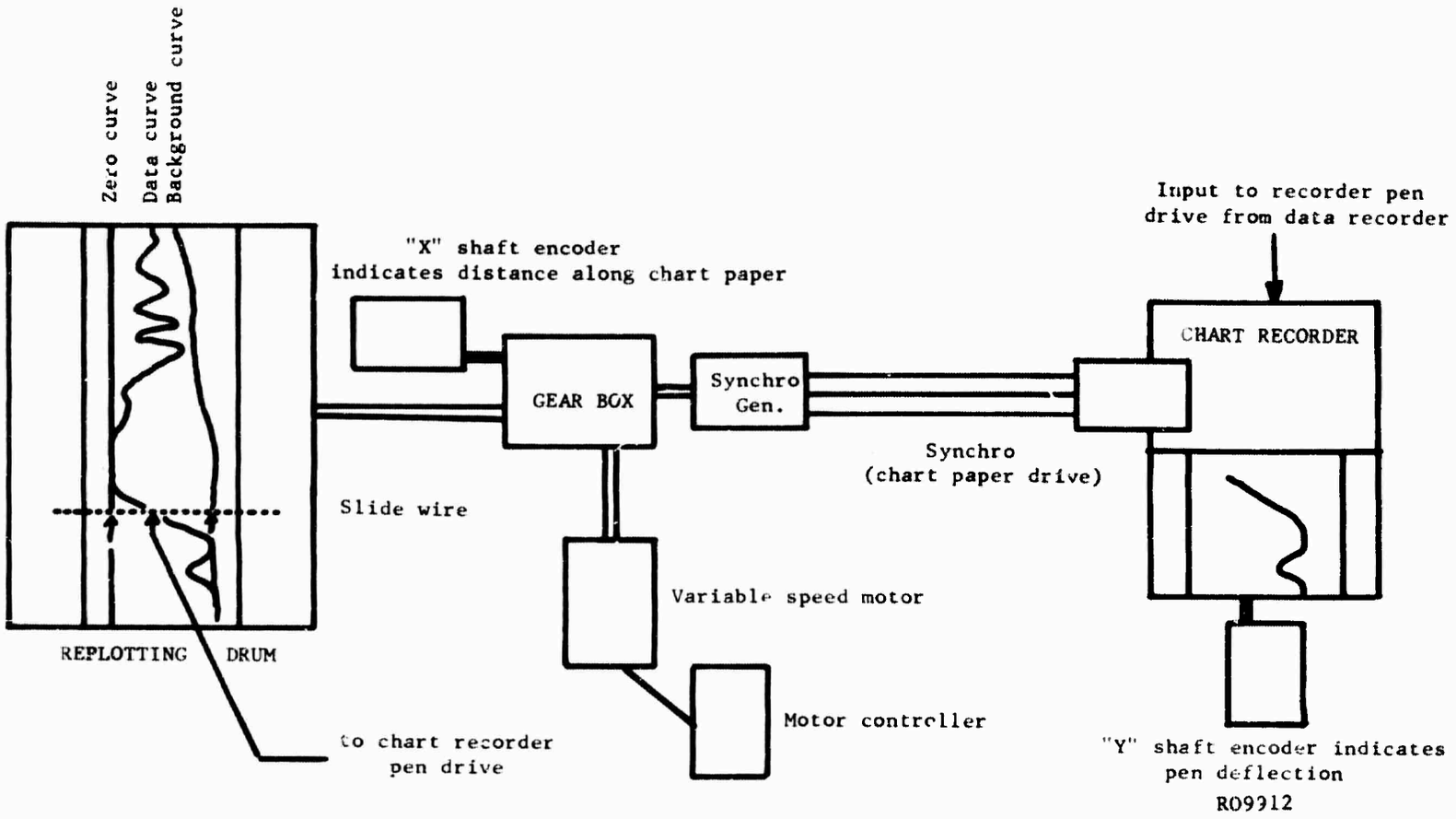
it provides for interlocking controls so that each punching sequence is completed before the following readout cycle can be initiated. The 80 columns of the IBM card can be used as convenient for recording the pairs of data points and any identifying code symbols. We have chosen to record seven pairs of data points and a five digit number to identify the spectrum on each card.

c. The Replotting and Digitizing System

Figure C-2 shows a modification of the direct digitizing system whereby the data previously recorded on strip charts can be digitized. In addition, if a zero level curve and a background curve are also recorded on the strip chart, the percent that the data curve is of the background curve can be digitized and replotted. The background curve corresponds to full scale; for example, in a simple transmission spectrum measurement of some sample it shows the spectrometer's output with the sample removed. In this application the alternative output shaft of the gear box drives a drum onto which is placed the strip chart which is to be digitized. This drum thus rotates in synchronism with the chart paper drive of the chart recorder and with the X Shaft Encoder. On a carriage mounted over the drum are three pointers which are tied to slide contacts along a slide wire--one for the background curve, one for the data curve and one for the zero level curve. A constant voltage corresponding to full scale deflection on the chart recorder is applied between the zero level slide contact and the background curve contact. The voltage from the data curve and the zero level contact thus give a measure of the percent deflection. Except to compensate for small drifts in the spectrometer characteristics, the zero point does not need to be adjusted. The data curve pointer is manually adjusted to follow the data curve; and through the use of two photodetectors in a bridge circuit and a servo system, the background pointer automatically follows the background curve.

III SUMMARY

We have described a very useful tool for the presentation and analysis of spectrographic data. The data can be directly digitized as it is being recorded or can be taken from strip chart records after corrections or modifications have been made. In addition, the percentage that a deflection shown on a strip chart is of some background curve can be recorded digitally and replotted. The output in the form of IBM punch cards enables the data to be conveniently introduced into a computer for additional analysis.



RO9912 FIGURE C-2. REPLOTTING AND DIGITIZING SYSTEM

PHILCO CORPORATION
A SUBSIDIARY OF Ford Motor Company

AERONUTRONIC DIVISION
FORD ROAD/NEWPORT BEACH, CALIFORNIA

January 28, 1965

Please find enclosed the corrected copy of page 3-5 for Report U-2955 entitled "Scientific Report - Absorption By CO_2 Between 4500 and 5400 cm^{-1}" dated 15 December 1964.

The strengths given for the bands under the sub-heading New Bands were all in error by a factor of 10^{-4} in the original report. Please make note in your copy or insert the attached corrected page.

Darrell E. Burch
David A. Gryvnak
Richard R. Patty

ARCHIVE COPY

Corrected Page 3-5 for Report #U-2955 entitled "Scientific Report - Absorption By CO_2 Between 4500 and 5400 cm^{-1}" by D.E. Burch, D.A. Gryvnak and R. R. Patty, dated 15 December 1964 - PHILCO, Aeronutronic Division

TABLE 3-2

BAND STRENGTHS

Transition[a]	ν_o cm^{-1}	$\int K(\nu)d\nu$ (atm^{-1} cm^{-1} cm^{-1}) STP				
		P	Q	R	Total Band[b]	Total Band Weber et al[c]
			Major Bands			
04^01	4853.578	0.11	0.00	0.12	0.23	0.30
12^01	4977.793	0.52	0.00	0.53	1.05	1.11
20^01	5099.619	0.15	0.00	0.18	0.33	0.47
			New Bands[d]			
15^10	4591.0	0.16×10^{-4}	0.04×10^{-4}	0.22×10^{-4}	0.42×10^{-4}	
$06^01\leftarrow10^00$	4587.75	0.06×10^{-4}				
$30^01\leftarrow02^20$	5217.63		0.00×10^{-4}	0.27×10^{-4}		
$02^02\leftarrow01^10$	5248	0.09×10^{-4}	0.17×10^{-4}	0.07×10^{-4}	0.33×10^{-4}	
$10^02\leftarrow01^10$	5349	0.03×10^{-4}	0.08×10^{-4}	0.03×10^{-4}	0.14×10^{-4}	

[a] All bands listed in this Table pertain to the $C^{12}O_2^{16}$ molecule.

[b] The uncertainty in the values for the major bands is about six or eight percent, but it is considerably higher for the new bands.

[c] Values are taken from Weber, Holm and Penner[3] and multiplied by 300/273 to adjust to density at STP. The authors give an uncertainty of ± 20%.

[d] The strengths of the new bands were determined from our raw spectra by Benedict[9].